UNDERSEA WARFARE

U.S. Submarine

Spring 2001

START III?
Arms Control and the Sub Force Debate

USS *Virginia* Construction

WWII Submarine Operations

Ships, Sensors, and Weapons

Sub Force 2001 Review

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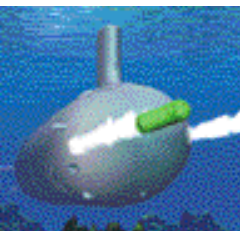

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On The Cover

This April marks the 101st anniversary of the U.S. Submarine Force! Our cover photo, taken during last year's Submarine Centennial, features MMFN (SS) **Michael Nelson** and STS (SS) **Christopher Martindell** and their shipmates from USS *Salt Lake City* (SSN-716) celebrating the anniversary in an unusual way by taking a dip in an Olympic-sized pool.

Photo by PH2 Aaron Ansarov

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UNDERSEA WARFARE

THE OFFICIAL MAGAZINE OF THE U.S. SUBMARINE FORCE

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UNDERSEA WARFARE is the professional magazine of the undersea warfare community. Its purpose is to educate its readers on undersea warfare missions and programs, with a particular focus on U.S. submarines. This journal will also draw upon the Submarine Force's rich historical legacy to instill a sense of pride and professionalism among community members and to enhance reader awareness of the increasing relevance of undersea warfare for our nation's defense.

The opinions and assertions herein are the personal ones of the authors and do not necessarily reflect the official views of the U.S. Government, the Department of Defense, or the Department of the Navy.

Contributions and Feedback Welcome

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RADM Sullivan graduated with distinction from the U.S. Naval Academy in 1970 and completed graduate education at M.I.T/ W.H.O.I. and the National War College. Starting his submarine career on the diesel submarine USS *Caiman* (SS-323), he later commanded the ships USS *Birmingham* (SSN-695) and USS *Florida* (SSBN-728) (BLUE) and served as Commander, Submarine Group Nine. Most recently, RADM Sullivan served as the Director, Operations and Logistics (J3/4) and then as Director, Plans and Policy (J5) at United Stated Strategic Command in Omaha, Nebraska.

In early April, I relieved VADM Mal Fages as the CNO's Director of Submarine Warfare (N77). When notified of my new assignment, I was initially struck by the magnitude of the challenges I knew I would face as the Director supporting our magnificent Submarine Force. At the same time I was honored to have this wonderful opportunity to influence the submarine community and help shape our bright future.

VADM Fages turned over a great organization, fully engaged in the wide spectrum of issues affecting the force in the Washington D.C. area. I very much appreciate Mal's hard work and wish him the best of luck as he puts on his third star and assumes his new duties at NATO headquarters in Brussels.

I view the primary mission of my staff to be facilitating the process of putting to sea the world's most capable submarines and crews in support of our national interests. To that end, my top priority is to support the submarine waterfront with the best ships, equipment, people, and training possible. While focused principally on near-term readiness, many of my staff's efforts deal with the future requirements of our force and meeting them with systems that often take years to develop and deliver into the hands of the forces afloat. I'm very encouraged by the work our Future Studies Group and Submarine Technology initiatives have produced to define our future vision. You will find many examples of our "next steps" toward that vision in this issue of UNDERSEA WARFARE.

As you read through the magazine, I encourage you to notice some of the common threads in our initiatives. One of these is the widespread use of commercial off-the-shelf (COTS) hardware and open system architecture (OSA) to allow us to build in flexibility for future upgrades. The process is really no different from that of purchasing a new home computer. All of us know that any system you buy can quickly become obsolete as new technology emerges, so you make sure it has open expansion slots and is upgradeable using standard components. When the latest video or sound card hits the market you are ready to pull the old one, drop in the new one, load the new drivers, and you're once again operating with cutting-edge technology. Other distinct advantages are greater compatibility and interoperability for all our systems. As opposed to our stovepiped legacy systems, future systems will be designed to allow new applications to be added and other systems to interface without having to re-design or replace them. We are incorporating these changes in our next generations of torpedoes, sonar systems, undersea surveillance systems, ESM equipment, and communications capabilities.

As submariners, we must not only anticipate a bright future, but embrace our rich heritage as well. When we make an error, we learn from it, and when things go well, we learn from that too. The customary historical article in this issue is the first of a two-part series about VADM Lockwood and the Submarine Force in World War Two. Although there were some victories early on, our tactics, training, and torpedoes were lacking at the outset. The lessons learned were much more than just how to make poorly designed weapons work properly – they went many layers deeper. We can all learn from the tenacity of those forerunners 60 years ago who were not afraid to admit there were problems, who were determined to make things right, and who eventually achieved "Silent Victory" in the Pacific.

Here in Washington, there is a lot of discussion about how the "transformed" military must incorporate the characteristics of stealth, firepower, and endurance. While I can think of no other platforms that better embody those characteristics than our own submarines, they'd be of little value if it were not for the superb efforts of all of you serving onboard or supporting our submarines at sea. Keep up the good fight! I am proud to represent you in the difficult, but important, Washington, DC arena.

RADM Paul F. Sullivan, USN
Director, Submarine Warfare

"Where's the Nearest Submarine?"

by RADM Paul F. Sullivan, USN

The Summer of 2004 will mark a critical milestone for submarine building, not only because the two most capable submarines ever launched – USS *Jimmy Carter* (SSN-23) and USS *Virginia* (SSN-774) – will enter service, but also because it will see the end of a five and one-half year gap in commissioning submarines. Never before in the history of the Submarine Force have we had so long a period without a new submarine entering the fleet.

The same way that the National Command Authority (NCA) asks, "Where's the nearest aircraft carrier?" during military crises, we're asking ourselves increasingly, "Where's the nearest submarine?" For Sailors in the fleet today, tasked with more missions than they can possibly support, the answer may be *half a world away*, en route to relieve on station. In terms of time, the answer for shipyard personnel may be the *summer of 2004* – or for a fleet CINC, *24 to 48 hours* – the time it can take to get an SSN into position to monitor a developing crisis. In any event, the nearest submarine is too far away for me in both time and distance. It will be too long before our next submarine finishes construction – and today at sea, the nearest submarine may be too far from the next hot spot, because we're spread too thin.

Today there are 55 SSNs and 18 SSBNs in operation. In contrast, when I was commissioned in 1970, we had 144 submarines, including 103 SSNs and SSs and – significantly – "41 for Freedom" SSBNs. Since that time, we have closed the chapter of our nation's history known as the Cold War and marked a major turning point in shifting our focus away from mostly deep-water ASW deployments to more engagements with allied navies, special operations, strike missions, and most importantly, surveillance and reconnaissance in theaters world-wide. These are not new missions. These are things that the Submarine Force has done for a long time. But we didn't do as many of them in the midst of the Cold War.

Navy Core Themes

Any discussion of force level needs to be grounded in an appreciation of the Navy's core themes, so I'd like to review them quickly first.

Let's start with the requirements: What do we need submarines to do in terms of their capabilities – and how many do we need today and in the future? The Quadrennial Defense Review (QDR) is currently trying to answer those questions for the entire military. As part of the Navy's QDR effort, a set of themes has emerged to define our service's role within the joint warfighting team as a whole. These themes are:

- Command of the seas
- Combat-credible presence
- Assured sustainable access
- Enabling the "transformation" of joint operations

Command of the Seas

Since the beginnings of our Navy, we have been charged to protect America's trade and the physical security of our allies. Today, with 99 percent of the world's trade volume and 64 percent of its value moved by sea, it should be clear that our economy is, and will continue to be, closely tied to the oceans. What would it be like if the Strait of Hormuz were closed? During the 1973-74 oil embargo, when the U.S. lost access to about 14 percent of the world's oil supply, there was a four percent increase in U.S. unemployment, a 48 percent devaluation of the S&P 500 stock index, and a six percent decline in the Gross Domestic Product. As a nation we cannot afford to let anyone deny us or our allies unrestricted access to strategic seas, and submarines have a proven history of effectively interdicting the forces of any nation who would deny our warships or trade vessels free passage.

Combat Credible Presence – U.S. Sovereign Power Overseas

Each U.S. warship is a sovereign entity, so there are no restrictions on when we decide to conduct flight operations from an aircraft carrier or position a naval show of force in international waters. This gives the Navy a unique role in preventing conflicts or joining them early on. With approximately one-third of our Navy forward-deployed today, we can back up our nation's words with on-scene combat capability. This is what presence is all about. Just the threat of an SSN off its coast may be enough to keep a belligerent country's navy in port, and the mere knowledge that an SSBN is on patrol can keep the peace and prevent war. We are there, and we are ready.

Assured Sustainable Access

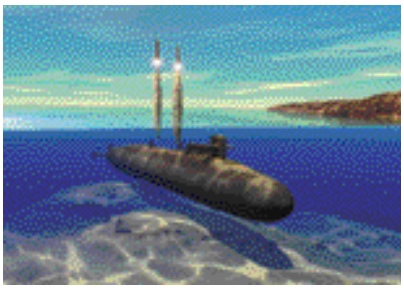
Many countries defend their borders by employing anti-access strategies that incorporate a number of layered sensors and weapons. Coastal cruise missiles, mines, radar pickets, and diesel submarines in littoral waters are a few examples of the threats that can be arrayed to discourage access to particular regions. Who but submarines can gather intelligence data on these defenses and monitor them 24 hours a day, 7 days a week, for months at a time? Who else can gain entrance, despite an anti-access strategy, and operate deep inside denied areas with negligible risk to platform and crew?

Out of Sight – Not Out of Mind. The 18 Ballistic missile submarines currently in operation continue to play an integral role in strategic deterrence and the mere knowledge, that an SSBN is on patrol can keep the peace and prevent war.

But access is also about positioning sensors and weaponry where they can be most effective, long before a conflict ever begins. Stealth affords us the opportunity to place a full load of weapons within range of targets deep inside the enemy's borders without his knowledge and without being provocative – and if necessary, employ mine countermeasures, strike, or ASW capabilities to foreclose his options. Submarines can force the door open – and hold it open – for the joint team.

Working Together – Transforming Joint Operations

In transforming the joint force to prevail in the combat scenarios of the new century, the



The SSGN Option. One near-term option for addressing the growing mismatch within the Submarine Force between requirements and assets involves converting four *Ohio*-class submarines to an SSGN configuration. This would allow each of them to carry up to 154 Tomahawk land attack missiles (TLAM) and deploy 66 SEALS or Marines through two nine-man diver lockouts.

Photo by AN Joe Hendricks

Forward Presence. The 55 fast attack submarines currently commissioned continue to be integral components of aircraft carrier battle groups around the world – just the threat of an SSN off its coast can be enough to keep a belligerent country's navy in port. Pictured here, the *Los Angeles*-class attack submarine USS *Baltimore* (SSN-704) steams alongside the guided missile frigate USS *Samuel B. Roberts* (FFG-58) and the aircraft carrier USS *George Washington* (CVN-73).

Submarine Force will be a key participant in achieving "full spectrum dominance" – with freedom to operate in all domains – sea, land, air, space, and information. Getting connected with network-centric warfare and placing a high priority on land attack are two areas where submarines are aiding the transformation. Here's a scenario showing how submarine stealth and combat capability will support the joint team:

> *Imagine being at periscope depth, well inside the enemy's layered defensive shield, during the prelude to a conflict. Your mission includes real-time photo reconnaissance of a beach for a landing which will occur tomorrow by Marines in the amphibious ready group. The Marines on the LHA have a remote, real-time view through your periscope from the same vantage point they will have during the landing. Three weeks of continuous surveillance using unmanned undersea vehicles (UUVs) deployed from your ship have already determined that the approach to this and four other possible landing sites are free of mines. Suddenly a call-for-fire is received, directing the ship to launch a Tactical Tomahawk (TACTOM) on an artillery/SAM battery targeted by a team of Army Rangers – positioned as forward observers for an air assault – who are under attack. Yours is the only platform close enough to put timely ordnance on the target with impunity. Five minutes later the missile is away, and discussions about the landing resume.*

As the vehicle for achieving the vision inherent in the Navy's core themes, the five key priorities of Chief of Naval Operations Admiral Vern Clark have been actively emphasized by the Submarine Force: manpower, current readiness, future readiness, quality of service, and alignment of words and deeds.

I'd like use the remainder of my space here to focus on just one of the CNO's priorities…

Future Readiness

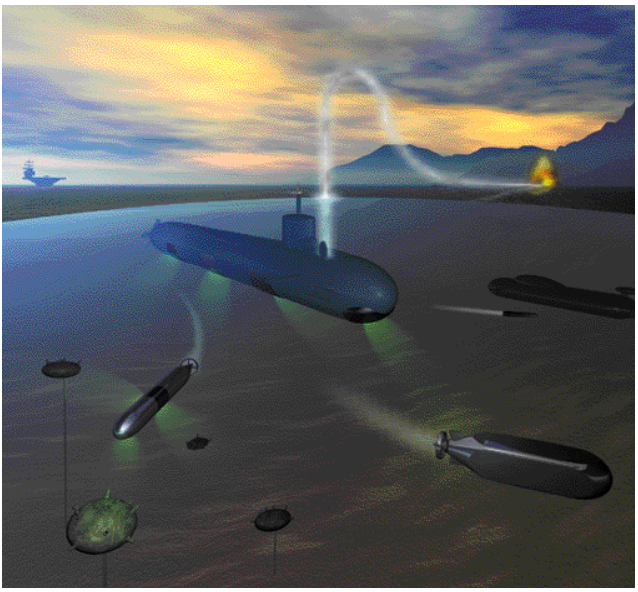
Because it wasn't based on real peacetime presence requirements and clearly needed further study, we have long decried the 1997 Quadrennial Defense Review's decision to reduce the number of attack submarines to 50. Now that we are almost down to that level, with 55 SSNs today, the Atlantic and Pacific Fleets are both facing the reality of that misjudgment. Last year, over 350 SSN intelligence-gathering mission-days went unfilled due to the lack of available ships. In 1999, the Submarine Force contribution to Seventh Fleet's forward presence requirement was met only 50 percent of the time. Much needed maintenance for ships has been pushed into the future as far as it can go. The inter-deployment training cycle (IDTC) has been reduced to the bare minimum. These demands are obviously taking a cumulative toll on the ships and their dedicated crews. What are the alternatives? Presently, all we can do is commit to making the most efficient use of the force we have – while working for more force structure in the future.

One example of our effort to meet requirements with the resources at hand is the initiative to homeport three SSNs in Guam, starting with the USS *City of Corpus Christi* (SSN-705) in 2002. Transit time to theater is a significant part of any deployment. For the Pacific Fleet, the transit from Pearl Harbor to the Western Pacific, Indian Ocean, and Persian Gulf is especially arduous. Ships in Guam are already inside the Seventh Fleet area of responsibility (AOR) and readily available to conduct ISR missions – and will offer more than twice the number of mission-days per year per ship compared to submarines homeported in Pearl Harbor. These ships will effectively always be on deployment with a continuous 50 percent OPTEMPO and no IDTC – an operating cycle unlike that of any other SSN. It's worth noting that this will be the first time submarines have been forward-based since SSBN operations in Holy Loch, Scotland ceased in 1992.

Potential Force Level Shortfalls

When *Jimmy Carter* and *Virginia* enter the fleet in the summer of 2004, they will be the first submarines commissioned since USS *Connecticut* (SSN-22) in December 1998 and will end a five and one-half year period with no new submarine commissionings. Even considering the military drawdowns following both World Wars and during the Great Depression, this is unprecedented. Only in the infancy of the Submarine Force, with the four-year hiatus between *Porpoise* and *Shark* in September 1903 and *Viper* and *Cuttlefish* in October 1907, have we come close to going this long without adding new submarines. This concerns me as both a submariner and a military professional who understands the myriad capabilities that modern submarines bring to the table.

As the CNO has stated, it is all too easy to fall into the trap of talking about platform numbers and not focusing on capabilities. At some point, however, there needs to be an objective evaluation that correlates platforms and their capabilities with requirements. In fact, this was done for us by the Joint Chiefs of Staff in the 1999 JCS SSN study (see the accompanying sidebar). With the current force level at 55 SSNs and a building rate that barely keeps up with the attrition of able – but aging – ships, we see a growing mismatch between requirements and assets. Even with an optimistic build rate of approximately two to three *Virginia*-class SSNs per year, we will just meet the JCS minimum 2015 warfighting requirement of 55 SSNs but fall well short of the actual peacetime requirement of 68 SSNs derived from CINC needs.



Operational Flexibility. The new *Virginia*-class submarine has been designed specifically to fight in the world's littorals and will offer greater operational flexibility in land attack, intelligence gathering, mine reconnaissaance, and special forces support.

Force Level Options

There are currently three options for addressing this mis-match: two for the near term, and one for the long term.

The first near-term option is to refuel eight first-flight, non-VLS, *688*-class submarines. These ships have an average of 13 years of hull life remaining, and the technical risk of such an undertaking is low, since we have been doing submarine refueling overhauls for many years.

The second near-term option is to convert four *Ohio*-class SSBNs to an SSGN configuration. Starting in fiscal year 2003, four TRIDENT SSBNs will be inactivated in accordance with the 1994 Nuclear Posture Review, which called for a deterrent fleet of 14 ships. These four large, capable submarines are each at only one-half of her 42-year hull life. To scrap these ships at a time when we are struggling to find ways to fill mission requirements and maintain the strike presence specified in the Global Naval Force Presence Plan (GNFPP)would be less than prudent. Each of these four TRIDENT SSBNs could be converted to carry up to 154 Tomahawk land attack missiles (TLAM) and deploy 66 SEALS or Marines through two nine-man diver lockouts. Additionally, the SSGN can attach two Dry-Deck Shelters (DDS), or two Advanced SEAL Delivery Systems (ASDS), or one of each. The SSGN operating cycle would be much like the current two-crew SSBN cycle, except every other crew turnover would be at a deployed site – an evolution regularly practiced in the SSBN force today. While these conversions involve some small technical risk, and there are significant arms control issues to overcome, our greatest challenge is making the required decision in time for the first TRIDENT decommissioning in two years.

The longer-term option is to increase the rate of building *Virginias*. The JCS study specifically calls for 18 of the new class in 2015. Current projections, however, predict only 15 *Virginia*-class and total of only 57 SSNs at that time. In fact, even with the two near-term options in place, we project that the SSN force level will fall below 55 starting in 2027, as the last of today's newest *688*s are inactivated. The ultimate solution will most likely be a combination of all three options, in which we extend the life of ships currently in the fleet and introduce new ones at a faster pace.

Conclusion

The basic warfare capabilities offered by submarines and the Sailors who take them into harm's way are stealth, endurance, and firepower. These attributes enable us to command the seas, provide combat-credible presence, assure sustainable access, and contribute to the transformation of the joint forces for fighting and winning in the 21st century. When it is so clear that the future of naval warfare is going to rest heavily on those distinctive characteristics so intrinsic to submarines, we cannot let them erode away. It's time to bring that nearest submarine even closer.

Results of the 1999 Joint Chiefs of Staff Attack Submarine Study

The 1997 QDR directed the Department of the Navy to reduce its SSN force structure to 50 by 2003 contingent upon a reevaluation of the peacetime forward presence requirements. Currently, there are 55 SSNs in the inventory.

In March 1998, the Deputy Secretary of Defense directed the Chairman of the Joint Chiefs of Staff (CJCS) to conduct this reevaluation and determine the SSN requirements for 2015 and 2025 to conduct peacetime forward presence, national intelligence, surveillance, and reconnaissance, and warfighting.

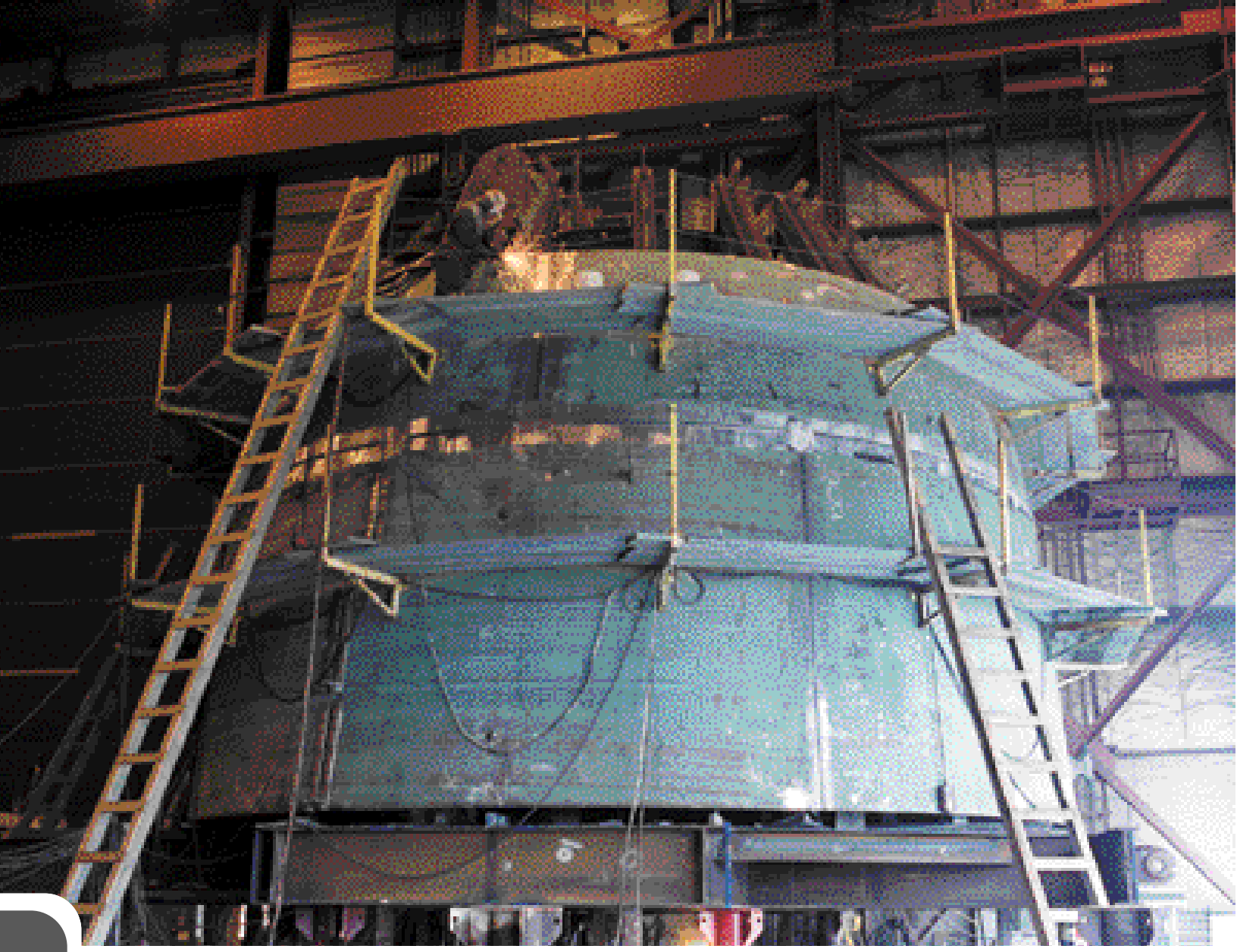
In 1999, the CJCS Attack Submarine Study was an exhaustive and collaborative effort among the regional CINCs, U.S. Special Operations Command (USSOCOM), the Department of the Navy, the Office of the Secretary of Defense, and the Joint Staff.

The study had three conclusions:

First, the study concluded that 68 SSNs in the 2015 and 76 in the 2025 time frame were required to meet all of the CINCs' and national intelligence community's highest operational and collection requirements.

Second, the study concluded that a force structure below 55 SSNs in the 2015 and 62 in the 2025 time frame would leave the CINCs insufficient capability to respond to urgent crucial demands without gapping other requirements of high national interest. Additionally, this force structure would be sufficient to meet the modeled warfighting requirements.

Third, the study concluded that to counter the technologically pacing threat would require 18 *Virginia*-class SSNs in the 2015 time frame.



STATUS REPORT:

PCU Virginia (SSN-774)

by CDR Tom Kearney, USN

THE *VIRGINIA*-CLASS SUBMARINE IS WIDELY REFERRED TO AS "THE WORLD'S MOST TECHNOLOGICALLY ADVANCED SUBMARINE," AND FOR THOSE WHO ARE INTERESTED, A SIGNIFICANT AMOUNT OF TECHNICAL INFORMATION IS READILY AVAILABLE ON HER CAPABILITIES. WHAT MANY SUBMARINE FORCE PERSONNEL ARE WONDERING, HOWEVER, IS WHEN THEY CAN ACTUALLY BE ASSIGNED TO THIS NEW CLASS OF SHIP. AS OFFICER-IN-CHARGE OF *VIRGINIA'S* PRE-COMMISSIONING UNIT, I ENCOUNTER MANY PEOPLE AROUND SUBASE NEW LONDON WHO NOTICE MY *VIRGINIA* BALL CAP AND EXPRESS GREAT INTEREST IN SERVING ON A *VIRGINIA*-CLASS SUBMARINE. OFTEN THEY ARE CURIOUS ABOUT HOW FAR ALONG WE ARE IN THE SHIP'S CONSTRUCTION AND MANNING PHASES. ACCORDINGLY, FOR THESE CURIOUS INDIVIDUALS I OFFER A CURRENT STATUS REPORT ON PCU *VIRGINIA*.

Presently, there are 53 crewmembers assigned to *Virginia*, with 39 nuclear-trained personnel, including myself, the Executive Officer, Engineer, Navigator, and four LDO division officers. In addition, I have two master chiefs (Chief of the Boat and Engineering Department Master Chief), and a chief corpsman, yeoman, supply chief, and a LAN administrator to round out the crew. The enlisted crewmembers have five-year projected rotation dates and are part of the first crew increment, called Increment A. Their initial manning date was 15 May 2000, after completion of the Reactor Plant Design School in April.

Increment A will be onboard through construction and sea trials, and remain until Post Shakedown Availability, which is typically about a year after delivery. Increment B will report in June 2002 and will include about 50 more crewmembers, including Auxiliary Division, Weapons Department, and Operations Department personnel. Three split-tour submarine-qualified junior officers and the ship's four department heads will also report with Increment B. Since the *Virginia*-class modular construction program has required Navy operational support at a much earlier date than previous new construction programs, the Increment A OIC, XO, and Engineer will also change over at the Increment B timeframe. This manning sequence will be the same for subsequent ships of this class.

The *Virginia*-class submarines are being built at both Electric Boat (EB) and Newport News Shipbuilding (NNS). Each shipyard constructs about one half of each ship and for the most part repeats the build of the same sections each time. The constructed sections from each shipyard are barged to their counterpart, and the shipyard designated as the "delivery yard" for that ship completes the construction. The delivery yard is also where the pre-commissioning crew will be stationed, and where the ship will undergo an extensive pre-delivery certification test program. Therefore, the crew of *Texas* (SSN-775) (the second *Virginia*-class ship) will report to NNS; the crew of *Hawaii* (SSN-776) will report to EB; and the crew of *North Carolina* (SSN-777) will report to NNS. Homeports for the ships have not yet been assigned.

PCU *Virginia* (SSN-774) Increment A crew

Since construction occurs at two separate shipyards, it may not be readily apparent how far along each ship is in construction. At this time, if the existing hull sections and completed components for *Virginia* were put together, she would be just under 50 percent complete. *Texas* is almost 30 percent complete, and *Hawaii* about 5 percent. Due to the way the submarines are being constructed, some sections are nearly finished while other sections consist of only rolled steel. For example, the forward part of *Virginia's* Engine Room and the Reactor Compartment are so far along that ship's force has recently commenced watch standing and testing in that section. *Virginia's* sea trials are scheduled for March 2004, with delivery scheduled for June 2004. *Texas* is scheduled for delivery in June 2005.

Photo by Chris Oxley, NNS

Looking Ahead. *Virginia's* sea trials are scheduled for March 2004; the second ship of the class, USS *Texas* (SSN-775), is currently on track for delivery in 2005. Pictured here, *Virginia* construction continues at Newport News Shipbuilding.

One significant change in this new construction program involves the way the Control Room and Combat Systems are being manufactured and tested. The Command and Control System Module (CCSM) is now being tested with a large contingent of contractor personnel and

(above) CCSM workstations

(right) the Command and Control System modulw (CSSM) is delievered to Groton, CT.

some Navy personnel assigned at EB. Once the testing is complete, the CCSM will be slid into its hull section for future joining to the full ship.

Benefiting from the considerable strides the Navy has made in using computer applications over the past several years, the *Virginia* class will mark an impressive milestone in the use of advanced networking. Everything from qualifications, administration, and logs to maintenance and operating procedures – both forward and aft – will be managed on an in-house Non-Tactical Data Processing System. This system consists of six Windows 2000 servers and 12 central processors with the capability of storing a staggering two tera-bytes of data – the computing power and capabilities of the tactical side are even more complex.

The office building where crewmembers work while *Virginia* is under construction is located at the EB facilities and has a replica of the extremely sophisticated LAN that will be used on the ship. Using this LAN, the *Virginia* crew is developing a streamlined connectivity process and is perfecting methods of conducting business in a paperless environment. Taking the existing database and downloading it onto the ship's network is all that will be required to shift operations from the PCU office building to the boat.

In concluding this status report, I should answer the initial question on many submariners' minds: How do I get involved? For those interested in being a part of one of the first *Virginia*-class ships, Increment B manning for *Virginia* is scheduled for June 2002, and Increment A manning for *Texas* is scheduled for January 2002. If you are interested in serving on these ships, I encourage you to talk to your detailer soon – it will be an experience you won't regret. Personally, I have to say that it is a remarkable platform to work on; the advances throughout the ship are extensive, in both the electronics and mechanical areas. Everyone assigned to one of these ships will find significant improvements all around.

(above right) A part of the hull section is delivered to Electric Boat in Groton CT

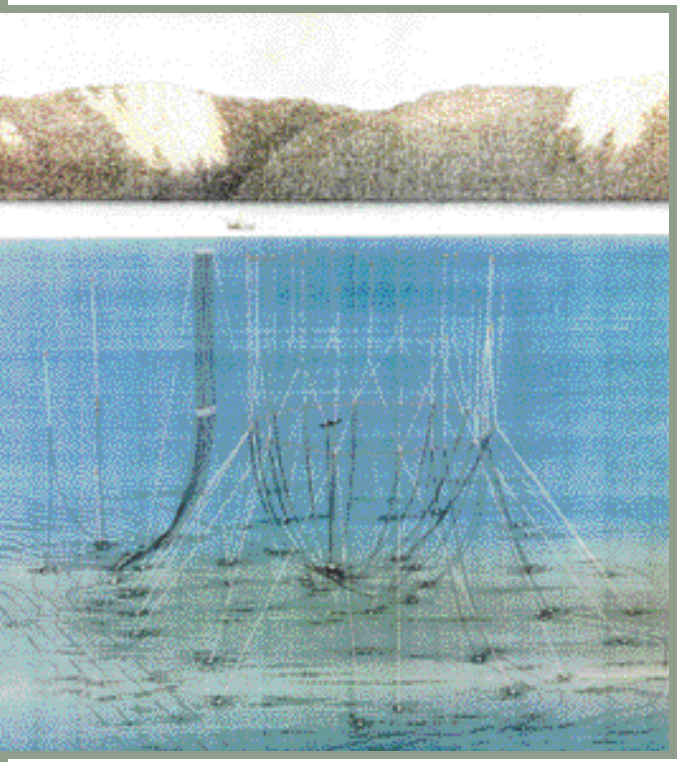
(right) USS Virginia's stern takes shape.

It is certainly an exciting time for the Submarine Force. The *Virginia* class is well on its way to becoming the core of the attack submarine force of the future, and it is today's submariners that have the opportunity to watch it all happen. The *Virginia*-class ships, and their future crews, promise to be key assets in the future of the world's most powerful Submarine Force.

CDR Kearney is the Officer in Charge of PCU *Virginia*.

SMALL SUBS PROVIDE BIG PAYOFFS for SUBMARINE STEALTH

by CDR David M. Fox, USN



Intermediate Scale Measuring System (ISMS). The ISMS consists of a 1,000-foot diameter submerged, horizontal circular hydrophone array, with an associated submerged sound projector array. The data recording and processing equipment 14 miles away is connected to the range by fiber-optic cables.

Have you ever looked at your submarine's propeller, perhaps during your last dry docking, and wondered, "Why is it shaped like that?" Or maybe you've wondered just how someone decided on the shape of the bow, or the sail, or other external parts of the hull.

The answer, of course, is that the configuration of these components was chosen specifically to allow your ship to go fast and employ its sonar effectively while remaining as stealthy as possible. Making submarines quiet, efficient, and effective is our main mission at the Navy's Acoustic Research Detachment (ARD) at Bayview, Idaho. As an integral part of the Navy's Research, Development, Test and Evaluation (RDT&E) community – namely, the Carderock Division, Naval Surface Warfare Center under the Naval Sea Systems Command – we execute this mission by operating large-scale submarine models on three ranges in Lake Pend Oreille, Idaho. A fourth range is used to pull submarine towed arrays behind a 60-foot surface vessel to evaluate array self noise using recording equipment on the towing vessel.

Why is the Navy in North Idaho of all places, 350 miles from the nearest ocean? Mostly, to take advantage of the conditions in Lake Pend Oreille. The largest lake in Idaho and the fifth deepest in the United States, Pend Oreille offers a virtually ideal venue for acoustic testing. First, it is deeper than 1,000 feet over an area exceeding 26 square miles, and its flat mud bottom minimizes sound reflection. A low level of particulates in the water results in minimal reverberation and scattering, and its ambient sound level is less than the ocean at Sea State Zero more than one fourth of the time. Moreover, the lake's water temperature remains at 39.5 degrees Fahrenheit below 300 feet all year, maximizing the repeatability of test results over time. Finally, at eight miles long by three to six miles wide, the testing volume is more than adequate.

While it is clear why the Navy takes advantage of the ideal conditions at Lake Pend Oreille, a more significant question might be why the Navy needs to use large-scale models to test submarine technology at all? The simple answer is cost. We can do model testing here at a fraction of the expense of using full-scale, operational submarines out in the fleet, while the large scale of our models (1/5 size and up) yields performance characteristics in the lake that closely

match those of full-scale submarines at sea. Since this quality of data cannot be obtained in small-scale model testing, our large models and large model operating ranges are vital to validating submarine stealth technology. ARD plays a key role in developing submarine stealth by serving as one element of a sequential process in which the RDT&E community validates new technology. This approach – shown in the accompanying sidebar – has been pursued by NAVSEA and the Carderock Division for more than forty years, resulting in the quietest and most capable Submarine Force ever.

(above) The submarine model *Dolly Varden* is hauled down to the bottom of Lake Pend Oreille in preparation for a buoyancy-propelled return to the surface during which flow-noise measurements will be recorded.

(right) Pictured atop LSV-2 are (left to right) CAPT Steve Petri, Commander, Carderock Division/NSWC; CDR Dave Fox, OIC, Acoustic Research Detachment; Mr. John Schuster, the OPNAV Submarine Directorate's civilian Science and Technology Director; and VADM John Grossenbacher, COMSUBLANT.

Submarine Model Range Facilities at ARD

We have several separate ranges in the lake to test various aspects of submarine sound quieting. The Buoyant Vehicle Test Range (BVTR) measures the noise produced by hydrodynamic flow over the bow and forward section of a submarine, while not masking it with the sound of propulsion or other onboard machinery. By using buoyancy to propel the model upward – like a cork – we avoid having to equip it with a propulsion system.

Operation of the BVTR is very simple. We use a shore-based winch to tow a buoyant submarine model (typically 1/5 the size of an SSN) to the bottom of the lake, stern first. A barge moored above and to the side of the range is used to control test operations, and hydrophones and accelerometers onboard the model are used to measure flow noise and operational data. After the model is hauled to the bottom and its motion settles out, we trip a release, and 15,000 to 25,000 pounds of buoyancy accelerate the model to the surface. As it nears terminal velocity, we have a window of four to six seconds to record the resulting flow noise. Near the end of the run, the stern planes are automatically shifted to dive, forcing the model to pitch over and ascend gently to the surface.

The BVTR has been used to determine the optimal shape, material, coating, mounting scheme, and overall design of the bow dome on every class of nuclear submarine since the USS *Sturgeon* (SSN-637) class. Modern sonars are much more efficient because of these experiments, since flow noise and its interference as background noise have been significantly reduced.

We use the Intermediate Scale Measuring System (ISMS) to test static (non- mobile) models. The newest of our ranges, ISMS consists of a 1,000-foot diameter submerged, horizontal circular hydrophone array, with an associated submerged sound projector array. We use a shore-based winch to haul the model to the center of the array (at a depth of about 500 feet), where it remains suspended for the duration of the test. The model is attached to a handling platform at the end of the haul-down cable, and operators can position it to present any desired aspect to the projector array. The ISMS can be used to measure the target strength of a submarine hull (that is, how effectively it re-radiates sound from a source not on the model) and how much sound is radiated into the water from a piece of machinery operating onboard. The data recording and processing equipment is on shore in Bayview, and is connected to the range 14 miles away by fiber-optic cables.

Finally, the Large Scale Vehicle (LSV) Range uses large, unmanned, autonomous submarine models to evaluate propeller noise, structural acoustics (overall hull structural vibration), wake production, and maneuvering and powering. In operation since 1987, the range itself consists of three distinct parts:

- The Acoustic Tracking and Communications System (ATACS), which consists of six hydrophones spread over the bottom of the lake for tracking and controlling the model
- The Radiated Noise Data Acquisition and Analysis System (RNDAAS), which consists of two vertical line hydrophone arrays that listen to the model as it drives by
- The Onboard Data Acquisition System (ODAS), which uses sensors, signal processing, and recording equipment on the model itself to record its self-noise signature and operating parameters

A specially configured Radiated Noise Barge (RNB) contains signal processing, operator control, and data recording equipment. Each time a test is conducted, the self-propelled RNB is driven to the range, where it is moored to a float and electronically connected to the ATACS and RNDAAS arrays. Two sound-isolated diesel generators on the RNB power the onboard instrumentation and the arrays once it is moored at the range. The ODAS system is self-contained on the model. To conserve battery power onboard, the model is towed to the range using a specially configured tender vessel.

(above) *Kokanee* (LSV-1), a self-propelled, quarter-scale model of the USS *Seawolf*, vents her ballast tanks while cruising on the surface of Lake Pend Oreille, Idaho, during a test at the Acoustic Research Detachment.

(above left) *Cutthroat* (LSV-2), shown here during initial launching, is a 0.294-scale model of the USS *Virginia* (SSN-774) that will operate as an unmanned, autonomous submarine test vehicle for evaluating new technologies.

Large Scale Vehicles

As one might expect, the two LSV models operated here are our largest and most complex vehicles. Essentially, they are unmanned, deep-diving submarines that operate under computer control. The LSVs are monitored, but not controlled, by the operators in the RNB and the tender that tows them, except during transit and in emergency situations. The first LSV, *Kokanee* (LSV-1), is a quarter-scale model of USS *Seawolf* (SSN-21) and is 90 feet long, 10 feet in diameter, and displaces 155 long tons. *Kokanee* looks like an SSN on the outside, but inside the forward half of the pressure hull, it contains 1,524 battery cells – about 25 tons worth – to provide power for the electrical propulsion motor (1,440 cells) and instrumentation (84 cells). The after half of the pressure hull contains the instrumentation, including guidance, navigation and control equipment, and the ODAS signal processors and recording equipment. The after compartment also contains a 3,000 horsepower electric propulsion motor, shaft bearings, and the propeller shaft itself. *Kokanee's* external stern configuration is similar to that of any SSN. Because they significantly influence the acoustic signature of the model, the pressure hull and external structures simulate a *Seawolf*-class submarine very closely.

Components inside the pressure hull have less effect on the acoustic signature, so we have substantial freedom there to deviate from the full-scale *Seawolf* configuration. (Obviously, we don't need a control room, crew's mess, or berthing spaces in an unmanned model.) *Kokanee's* stern control surfaces operate similarly to those on an SSN, except that they are operated by computer rather than Sailors. *Kokanee* was used to evaluate propulsor configurations for the *Seawolf* class, and was a key contributor to achieving the unprecedented stealth of those ships at high speed. Now, the model is also being used to evaluate propulsor and other technologies for the USS *Virginia* (SSN-774) class.

Our newest model, *Cutthroat* (LSV-2), is the largest unmanned operational submarine in the world. A 0.294-scale model of the pre-commissioning USS *Virginia*, it is 111 feet long, 10 feet in diameter, and will displace 205 long tons when delivered. Currently still under the custody of the shipbuilder, a joint team from Newport News Shipbuilding and General Dynamics Electric Boat, *Cutthroat* will be delivered to the Navy and become operational in the summer of 2001. Construction will be completed at Bayview.

Cutthroat is similar to *Kokanee*, but more advanced. Enhancements include a larger overall scale – 29 percent, vice 25 percent for *Kokanee* – which will improve the fidelity of test data to full-scale results. *Cutthroat* is designed to be more modular than *Kokanee*, so that major modifications, including radical hull changes, can be made with less impact to other systems onboard the vessel. Another advantage is an increase in ODAS capability. The *Cutthroat* ODAS will have twice as many data channels recorded as *Kokanee* at delivery – 512, vice 256 – and this is upgradable to 1,536 recorded channels. The *Cutthroat* ODAS converts the data from analog to digital form and processes the data digitally. In *Cutthroat*, data recording can be configured electronically under computer control, whereas *Kokanee* uses a patch panel. *Cutthroat* is equipped with a 3,000 horsepower permanent-magnet, radial-gap electric propulsion motor, provided to the Navy under a unique partnership agreement with General Dynamics Electric Boat, the owner of the technology. This motor is easily upgradable to 6,000 horsepower. Other order-of-magnitude improvements were engineered into the guidance, navigation, control, and propulsion systems, including the addition of torque sensors and other sensors of mechanical data for better reconstruction of the scenario.

Successive steps for submarine technology insertion

1. Concept development for potential technology improvements by RDT&E community
2. Analytical calculations, numerical models, and/or computer simulations
3. Small-scale model testing at the David Taylor Model Basin at the Carderock Division or the Large Cavitation Channel at Memphis, Tenn.
4. **LARGE-SCALE MODEL TESTING AT THE ACOUSTIC RESEARCH DETACHMENT**
5. Full-scale testing on an operational SSN at the Southeast Alaska Test Facility (SEAFAC), or using USNS *Hayes* (AG-195) at an Atlantic Fleet open-ocean range.
6. Across-the-board insertion of demonstrated technologies into the Submarine Force

Payoff for the Navy

The addition of *Cutthroat* to the ARD model fleet is expected to provide improvements to the *Virginia* class in the areas of stealth,

(continued on page 48)

ARMS CONTROL *and the* FUTURE SUB

How would START III negotiations affect the Submarine Force? How has START II complicated current debates over SSGN conversion, SLBM limitations, and NMD?

by Ambassador Linton F. Brooks

Our TRIDENT submarines, like USS *Pennsylvania* (SSBN-735) pictured here, are the most survivable of the strategic nuclear forces.

With planned and unplanned maintenance, qualification, underway preparations, retention, promotion, watchstanding, future assignments, and all the other concerns facing undersea professionals, why should submariners – or anyone else – spend time worrying about an arcane subject like arms control? After all, large complex treaties might have been important in the 1980s, but the Soviet Union is gone. Isn't arms control a Cold War topic of no particular relevance to today's fleet?

Not exactly. In important ways, the current strategic submarine force is shaped by the arms control decisions of the past and will be shaped further by arms control decisions made over the coming years. For reasons almost entirely unrelated to submarines, it is especially difficult to foresee those future decisions today. Thus there is likely to remain considerable uncertainty about the future constraints under which the Submarine Force must operate.

How did we get here?

Arms control is not an end in itself, but a tool to be used in the pursuit of national security. Like any tool, arms control can be misused, but if used correctly, it can make a significant contribution. Since strategic arms control began in earnest in November 1969, with the opening of the SALT I negotiations, a variety of justifications have been offered for pursuing negotiated arms reductions, first with the Soviet Union and now with Russia. At various times people have viewed strategic arms control as a way to save money, to reduce the risk of war, to constrain particular capabilities that the United States preferred not to match, to ensure perceived equality between the two Cold War superpowers, to provide a mechanism for Cold War dialogue, and to place limits on nuclear weapons because they were viewed as too destructive to have any legitimate moral purpose. The most valid and enduring reasons for pursuing arms control, however, have been to enhance stability in a crisis by restructuring strategic forces, and to provide predictability – and thus stability – over the long term by allowing each side to know the strategic forces it will face in the future.

Predictability is a familiar term; crisis stability is not. Simply put, stability in a crisis requires that neither side has any incentive to initiate a nuclear attack even in time of great tension. From this perspective, "good" or stabilizing systems are those that can survive an attack; "bad" or destabilizing systems are those whose vulnerability invites attack. Guided by this logic, the United States has not sought reductions in strategic nuclear forces for the sake of the reductions themselves, but rather has sought to reduce the risk of nuclear exchange by negotiating preferential reductions in the most destabilizing systems.

Because submarines are survivable, arms control has tended to favor them; thus, over the years, arms control treaties and the policy that guides them have caused us to shift more and more of the strategic nuclear deterrent to sea. In contrast, ICBMs, especially those silo-based ICBMs with multiple warheads, have often been regarded as destabilizing. Given current ballistic missile accuracies and yields, it is assumed that no silo-based ICBM can survive a nuclear strike. Thus there is an incentive to use them before they are destroyed. This incentive is even greater for ICBMs with multiple warheads, since if they are allowed to survive and to launch, they are highly effective weapons.

A crucial aspect of the U.S. arms control approach is to insist on effective verification. Arms control treaties

FORCE

lose their value if we cannot be certain they are being adhered to. This doesn't mean we require perfection, but we must be able to detect any militarily significant cheating in time to react before the strategic balance can be altered. Verification of nuclear arms control treaties is based on three components: our own ability to use satellites and other methods to monitor the treaty, detailed inspections, and a large scale data exchange, updated with various formal notifications.

Guided by these broad principles of stability and verification, the United States signed the first Strategic Arms Reduction Treaty (START I) in July 1991. Among many other provisions, the massive treaty imposed a total limit of 4,900 ballistic missile warheads, limited TRIDENT SLBMs to no more than eight warheads, and

Two U.S. Air Force officers man the launch console in an underground Minuteman ICBM silo.

created an extensive inspection and data exchange regime. Six months after START I was signed, the Soviet Union collapsed, to be replaced by 15 separate new states. In this new world, the START I warhead levels – which only a year before had been seen as representing deep reductions – now seemed excessive. In the post-Cold War euphoria, START II was quickly negotiated. Signed in January 1993, it called for cutting total warheads to 3,500, eliminating ICBMs with multiple warheads, and imposing a sub-limit of 1,750 SLBM warheads. These restrictions on SLBM warhead levels were not something the United States wanted, but were part of the price we had to pay to gain Russian agreement to eliminate all ICBMs with multiple warheads. The sub-limit was designed to allow the United States to keep 18 TRIDENT SSBNs, each with missiles carrying a reduced payload of four warheads apiece, for a total of 1,680 SLBM warheads. In 1994, however, the Department of Defense Nuclear Posture Review decided, largely for budgetary reasons, to reduce the number of strategic submarines to 14, split between two oceans and all carrying the TRIDENT II (D-5) missile. This remains the plan today.

Where are we now?

Signing treaties is not enough; they must be ratified. Ratification requires approval by the U.S. Senate and the Russian Duma (parliament). START I was ratified and has been in force for several years. For several years after START II's signing, however, Russia was not able to gain the required approval from the Duma for its ratification. Most of the issues preventing ratification were not related to arms control; instead they were either general East-West issues (NATO expansion, Bosnia) or internal Russian political problems having to do with relations between then-President Boris Yeltsin and his legislature.

In addition to these domestic political issues, however, START II also became embroiled in a Russian desire to be given more time to implement the required reductions and negotiate still lower levels as it became clear the Russian Federation could not afford to maintain the forces allowed it under the original START II Treaty. In 1997, in Helsinki, Finland, President Clinton sought to meet this Russian concern by agreeing to delay the date for completing the reductions required by START II and to negotiate a future START III treaty once START II took effect. This future treaty (never actually negotiated) would have reduced warheads still further, to between 2,000 and 2,500 total strategic warheads on each side. Even these levels are more than Russia can afford; they now call for reductions to between 1,000 and 1,500 warheads.

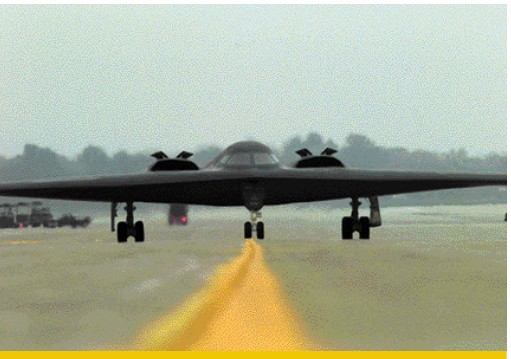
While they sparred over further reductions, both the United States and Russia based their long-term planning on the presumption that

(far left) The C4 TRIDENT I and D5 TRIDENT II missiles are the mainstay of seaborne nuclear strike capability.

(left) The 1993 START II negotiations allowed the United States to keep 18 TRIDENT SSBNs, with 4 nuclear warheads on each missle. The 1994 DoD Nuclear Posture Review called for the number to be lowered to 14, which remains the plan today.

START II would ultimately take effect, although Congressional restrictions prevented the United States from reducing below START I levels while START II remained unratified. In recent years, that presumption has increasingly been drawn into question by a new factor: national missile defense. There is a growing political consensus in the United States to deploy a nation-wide defense against ballistic missiles launched from states like North Korea or Iran. Unfortunately, the 1972 Anti-Ballistic Missile Treaty, signed with the Soviet Union, bans such national defenses. Russia is unwilling to allow START II to take effect unless the United States promises to continue to abide by the ABM Treaty, thus foregoing missile defenses. The United States is equally insistent that the ABM Treaty must be modified before it will agree to further reductions and has suggested that if Russia fails to agree to such modifications, we will exercise our right to withdraw from the treaty.

The Clinton administration sought to break the impasse by seeking modest changes in the ABM Treaty (to allow deployment of a quite limited national missile defense system) in return for agreeing to reductions well below the START II level, although not as low as Russia sought. Spurred by concerns from the Joint Chiefs of Staff and, especially, the Commander-in-Chief of the U.S. Strategic Command, that levels of strategic warheads below those agreed to at Helsinki would require a detailed review of U.S. targeting strategy, President Clinton rejected Russian calls for still deeper reductions. Despite significant efforts and an almost unending series of meetings, no progress has been made. The new administration is now considering how to proceed. Because President Bush is on record as calling for more extensive national missile defenses than his predecessor, a quick negotiated resolution may be difficult.



Our newest intercontinental bomber, the stealthy and highly survivable B-2 Spirit, can deliver both conventional and nuclear ordnance with unprecedented precision.

A further complication has been the growing interest in converting the four SSBNs planned for removal from strategic service into cruise missile submarines (SSGNs), each carrying six or seven conventional Tomahawk missiles inside 22 of the 24 tubes (the remaining two tubes would be used to support SEALS). The ships have considerable operating life left, and the value of Tomahawk in both small contingency strikes and large-scale campaigns is widely accepted. But if arms control is to deliver the predictability it promises, both sides must be certain that ships removed from accountability under START cannot be easily restored to strategic service. As a result, the START Treaty requires that the four potential SSGNs continue to count against strategic arms totals unless all existing launch tubes are removed. Such removal would double the cost of the SSGN conversion at a time when the Navy has had difficulty identifying funding for any form of conversion.

It might be militarily acceptable to proceed with the SSGN conversion and simply continue to count these ships against the strategic arms totals allowed under START I, in effect pretending they still carried SLBMs. Because START I allows significantly more warheads than our current operational plans require, this so-called "phantom warhead" approach would have no significant military impact. Counting the SSGNs against the lower levels of START II or a hypothetical START III, however, would almost certainly be militarily unacceptable. The United States could, of course, seek to negotiate an arrangement with Russia to put these four ships in a special category. There is precedent for this: the conventionally-armed B-1 bomber force does not count against START II totals. It would be relatively simple to devise a verification regime that used a combination of satellite observation and on site inspection to assure Russia that the SSGNs carried Tomahawks, rather than SLBMs. But there won't be any negotiations on these kinds of details until Russia and the United States reach some form of agreement on national missile defense.

What about the future?

Today the leaders of the Submarine Force face a dilemma. They don't know if they will reduce warheads to comply with START II (or an even lower level) or remain at current levels. They don't know what arms control regime will govern a possible future SSGN. Indeed, they don't know what approach the new administration will take to strategic arms control. Some have argued that arms control is a Cold War relic that should be replaced by more informal mechanisms. Several things must happen before the situation clarifies:

The administration has to decide its overall attitude toward strategic arms control. Because arms control is a means to advance national security, and not an end in itself, it is important to consider

how it should be applied in the new, post-Cold War world. In particular, the administration has to decide whether to continue to seek to negotiate changes to the ABM Treaty or act unilaterally.

If formal arms control negotiations are to resume, the administration will need to decide what its objectives are. Even if the issues surrounding national missile defense could be resolved, there are many other issues standing between the United States and a new START III. New provisions to allow an SSGN will be part of a long list of arms control objectives. Among the goals suggested for future arms reduction negotiations are new bomber counting rules, rejection of all Russian attempts to limit conventional forces (including conventional Tomahawks), constraints on Russian non-strategic nuclear weapons, improved transparency and warhead destruction, and simplification of verification in order to save money. Gaining agreement to all of these will be time-consuming, if it is possible at all.

Whether or not arms control resumes, the president has called for a detailed review of all elements of strategic deterrence, including U.S. targeting strategy. Separately, Congress has mandated a formal Nuclear Posture Review, due in December 2001, to address overall nuclear force structure. The results could affect the strategic Submarine Force significantly, although it is difficult to predict exactly how.

These various reviews can combine in several ways. The United States could decide to eschew additional formal strategic arms negotiations, and simply set its strategic force levels based on military requirements. Since this would leave START I as the only relevant limitation, there would be plenty of room to deploy SSGNs using the lower-cost phantom warhead approach described above. Alternatively, a new negotiating approach or (more probably) a new attitude in Russia, could lead to quick agreement on a package combining ABM Treaty changes with some form of START III. In such a package, it might well be possible to negotiate a special exemption allowing SSGNs to be converted in the most cost-effective manner, without removing the existing launch tubes.

(above) The venerable B-52 Stratofortress intercontinental bomber was first delivered in 1955, but the B-52H version is still flying as a significant element of our manned nuclear deterrent.

(left) An important element of the U.S. strategic deterrent is a fleet of continually airborne command centers, one of which is shown here during aerial refueling from an Air Force tanker.

On the other hand, it is possible, though less likely, that the United States could find itself engaged in prolonged negotiations, forcing decisions on the SSGN to be made without knowing whether or not existing launch tubes must be removed. Because the difference between conversion with and without removing SLBM launchers is a half billion dollars per ship, this would place the Navy in an intolerable position.

Those ships that will remain in strategic service also face uncertainty, although the consequences are less dramatic. Will we continue to maintain 14 SSBNs in two oceans? Will those ships be downloaded (that is, have the number of warheads per missile reduced to meet START II arms limits)? Or will there be more drastic reductions, either unilaterally or as part of a revitalized negotiating process? Any of these outcomes is possible. The Submarine Force is legendary for its flexibility in adapting to changing circumstances. It is likely to need that flexibility in the coming months.

Conclusion

The complexities of arms control clearly complicate submarine planning. It may well seem that treaties are more trouble than they are worth. The administration review may come to that conclusion. But it is important to remember that the battle for democracy in Russia has not yet been won. While the United States wants to move away from Cold War confrontation, the transparency and predictability that arms control provides may continue to be important.

In this time of uncertainty two things are clear. The Submarine Force will continue to be the dominant leg of U.S. strategic forces, providing the survivable retaliatory capability that is the foundation of nuclear deterrence. And the credibility of that deterrent will not rest on numbers or on targeting strategy alone, but on the continuation of the forty-year record of reliable, professional, undetected patrols that is one of the Silent Service's enduring contributions to our nation's security.

Ambassador Brooks was the negotiator of the START I Treaty of 1991. A former Commanding Officer of USS *Whale* (SSN-638), he is now a vice president at the Center for Naval Analyses.

USS *Florida* Completes the 3500th Strategic Deterrent Patrol

Deterrence Park, located in Bangor, WA, was dedicated on 25 May 2001 in a ceremony which commemorated the 3,500th strategic deterrent submarine patrol.

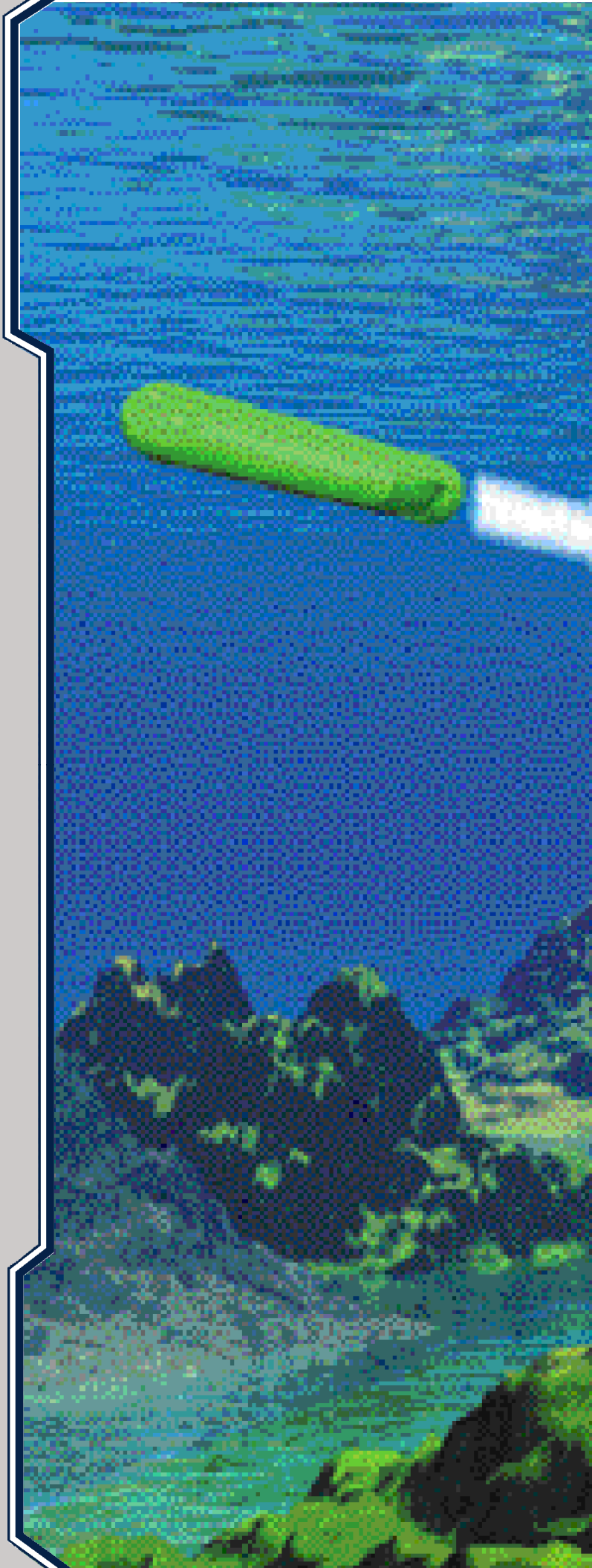
On 25 May 2001, USS *Florida* (SSBN-728), homeported in Bangor, WA, completed the 3,500th Strategic Deterrent Patrol, marking a new milestone for fleet ballistic submarines. Since USS *George Washington* (SSBN-598) set out on the first deterrent mission in November 1960, these submarines have silently patrolled the vast oceans, maintaining the sea-based leg of the strategic triad. Since that time, every one of these ships, and their dedicated crews, have safely returned home to the peace and prosperity their presence guaranteed.

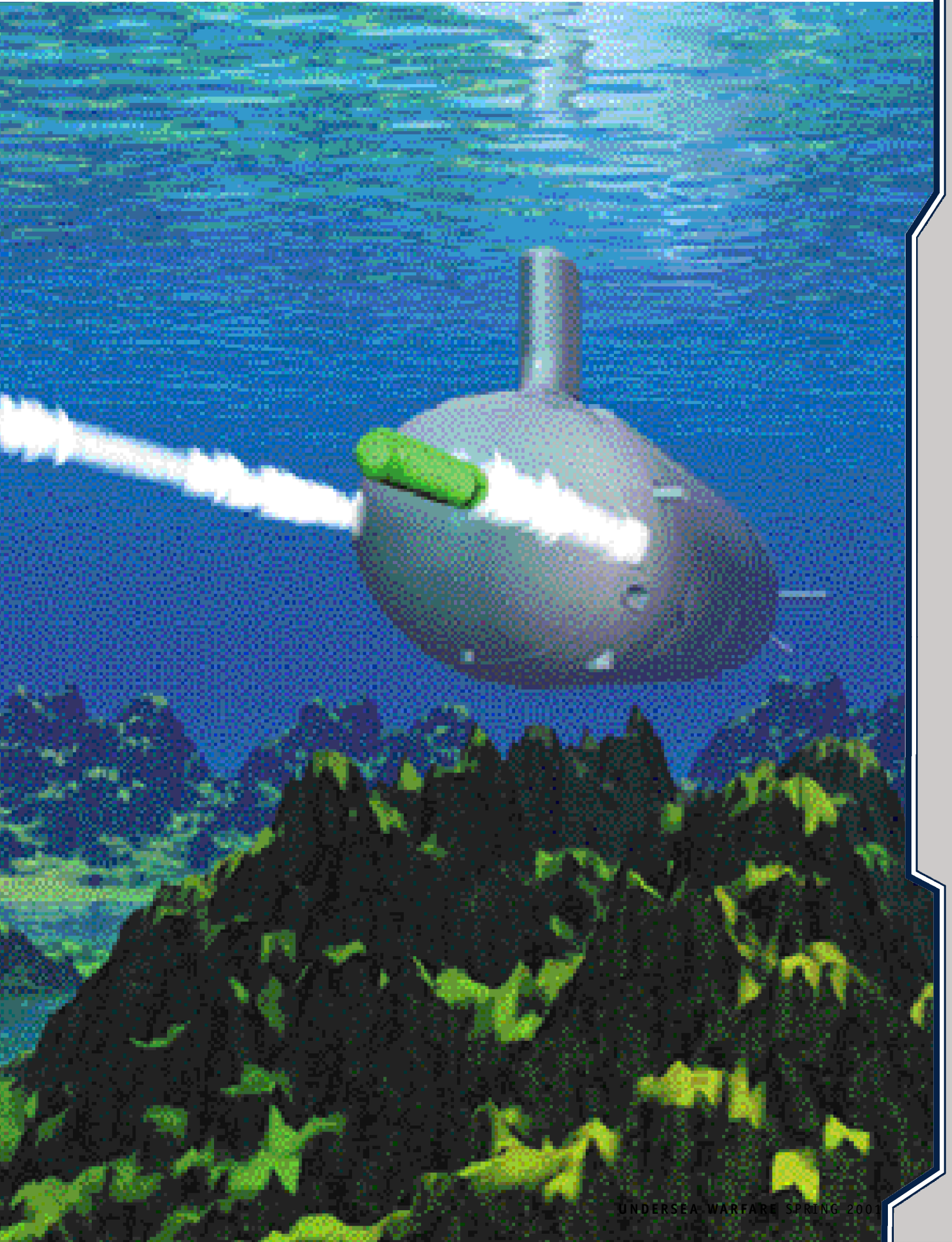
Reaching this milestone gives the opportunity for everyone who has designed, built, or served onboard SSBNs to reflect with pride on their lasting contribution to the security of the United States.

SHIPS, SENSORS, & WEAPONS

UNDERSEA WARFARE PROGRAMS TARGET AN EXPEDITIONARY FUTURE

As the armed services re-orient themselves toward a greater emphasis on expeditionary warfare, the Navy continues to refine its ability to gain and sustain access, conduct network-centric operations, and project power "...*From the Sea*" in the 21st century. Accordingly, the focus of the Submarine Force research, development, and acquisition programs is also moving in that same direction. While still maintaining their ability to prevail in sustained "blue water" conflicts against world-class adversaries, America's submarines are moving increasingly into the littorals of the world to face new challenges. Recent national tasking for increased intelligence, surveillance, and reconnaissance (ISR) missions in these areas are already outstripping their ability to address the current mission at hand. Moreover, within future joint force or coalition contingencies, U.S. submarines will be relied upon to be the first in, establishing clandestine – or deliberately overt – presence, well before the outbreak of hostilities. Their first mission will be to deter our potential adversaries, and if deterrence fails, they reserve the ability to launch a first strike from remarkably close range.

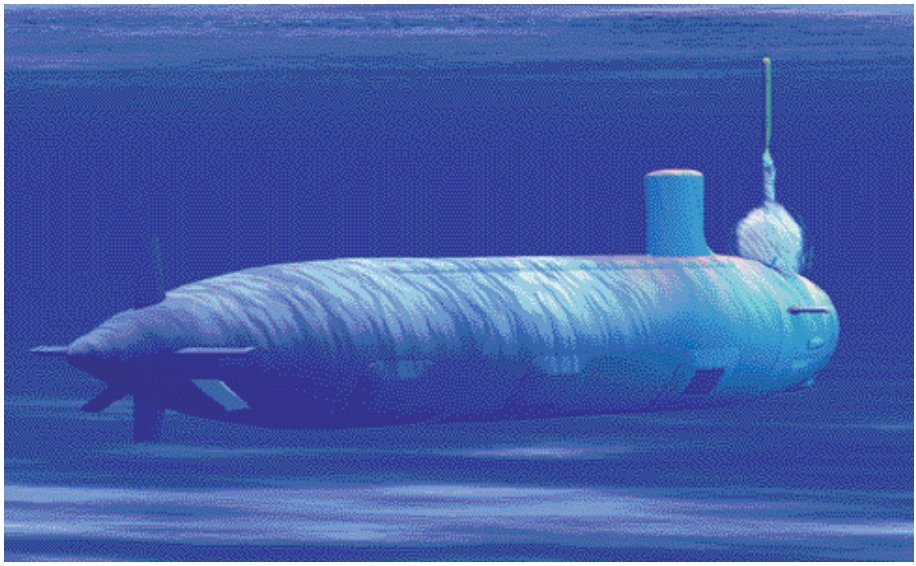




New Platforms for New Missions

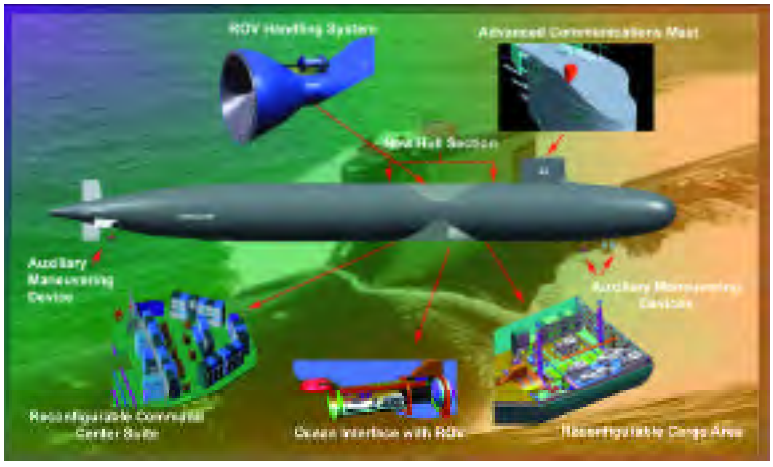
While designed primarily for Cold War-era anti-submarine warfare (ASW) and to provide direct support to aircraft carrier battle groups (CVBGs), our present force of 51 USS *Los Angeles* (SSN-688) and Improved 688-class submarines is well equipped for both ISR and strike missions. Their inherent acoustic stealth, new and improved sensors, and vertical-launch missile tubes for Tomahawk land-attack missiles have prepared these increasingly venerable, yet still powerful, submarines for a wide range of contingency and wartime missions. Two new attack submarine classes currently under construction are especially well prepared to serve in expeditionary roles – the **USS *Seawolf*** (SSN-21) and **USS *Virginia*** (SSN-774) classes.

Seawolf herself was commissioned in July 1997 and USS *Connecticut* (SSN-22) in December 1998. The third of the class, USS *Jimmy Carter* (SSN-23), is now under construction and will deliver in 2004. The *Seawolf* class was intended originally to be the successor to the 688 class and was designed to achieve higher submerged speeds, deeper diving capabilities, and a new order of machinery quieting. With new combat and sensor systems and an increased payload capacity, *Seawolf* has demonstrated superior warfighting capabilities for both deep-ocean and littoral missions. *Jimmy Carter* will be a unique multi-mission platform, with additional volume and an innovative ocean interface module for accommodating new capabilities in Naval Special Warfare (NSW), tactical surveillance, and mine warfare. In this regard, *Jimmy Carter* will embody many of the recommendations of the 1998 Defense Science Board study that called for novel payload capabilities and a more flexible interface with the undersea environment.



Combat Ready. USS *Virginia* (SSN-774) will expand on the ability of submarines to operate inside an enemy's defenses not only for surveillance, but to deliver powerful precision weapons to targets on land or sea.

The 30-ship *Virginia* class will incorporate similar advanced acoustic technology, but with increased use of commercial off-the-shelf (COTS) components and modular construction techniques, it will be less expensive to build. Modularity allows for construction, assembly, and testing of systems prior to installation in the ship's hull. This reduces costs, minimizes rework, and simplifies system integration. The modular design also facilitates technology insertion in both the new construction of future ships and



USS *Jimmy Carter* (SSN-23) incorporates new innovations in submarine design.

WHILE THE *VIRGINIA* SSNS WILL PERFORM TRADITIONAL OPEN-OCEAN ANTI-SUBMARINE AND ANTI-SURFACE MISSIONS, THEY ARE SPECIFICALLY DESIGNED FOR MULTI-MISSION LITTORAL AND REGIONAL OPERATIONS

back-fit into existing ships throughout their 30-year service lives.

While the *Virginia* SSNs will perform traditional open-ocean anti-submarine and anti-surface missions, they are specifically designed for multi-mission littoral and regional operations. These advanced submarines will be fully configured to conduct mining and mine reconnaissance, Special Operations Forces insertion and extraction, battle group support, intelligence-collection and surveillance missions, sea control, and land attack. Furthermore, they have been specifically designed

Team Effort. The *Virginia*-class submarines are being built at both Electric Boat and Newport News Shipbuilding. Each shipyard constructs about one half of each ship, and for the most part builds the same sections each time. The shipyard designated as the "delivery yard" completes the final construction.

with an open architecture and system/component modularity to allow easy reconfiguration for special missions and emerging requirements.

The first four *Virginias* are being constructed under an innovative teaming arrangement between General Dynamics' Electric Boat Corporation (EB) and Newport News Shipbuilding (NNS), in which the two companies are constructing different portions of each ship. EB will assemble and deliver the first and third ship; NNS the second and fourth. Construction of *Virginia* began in 1998, and the second submarine of the class, *Texas* (SSN-775), began construction in FY 1999. *Hawaii* (SSN-776) will be laid down in 2001. *Virginia*-class acquisition will continue over the FYDP at a rate of one ship per year. Under Program Objective Memorandum (POM) 2002, production will increase to two ships per year beginning in FY 2007.

Building New Capabilities for Intelligence, Surveillance, and Reconnaissance

For close-in, non-provocative surveillance and reconnaissance in hostile coastal areas or in support of allied maritime forces, no other platform offers the vantage point or the endurance of a nuclear-powered attack submarine. But satisfying the increasing demand for submarine ISR services requires not only a sufficient number of platforms, but also state-of-the-art sensor systems capable of gathering a growing variety of signals, threat intelligence, and environmental data. Submarines in ISR roles also need robust communication pathways, both to receive tasking and to disseminate the vital intelligence information they collect. A number of new sensors and systems address this growing need.

ACOUSTIC SENSORS, PROCESSING SYSTEMS, AND FIRE CONTROL

In the area of underwater surveillance, for example, several new acoustic sensor, signal processing, and fire control systems are coming on line. These systems will build on our robust deep-ocean capabilities to provide even greater sensitivity to slow, quiet targets in shallow, coastal waters. Additionally, mine detection and avoidance have become key requirements for achieving and maintaining access to the littorals, placing additional demands on new sensors and systems.

For use as its primary long-range acoustic sensor, the submarine community is developing the **TB-29A Submarine Thin-line Towed Array** as a COTS version of the legacy

(continued on next page)

The USS *Emory S. Land* (AS-39) keeps submarines ready while deployed to the Mediterranean Sea.

TB-29 towed array. These arrays will be used to back-fit the *Los Angeles*-class submarines (both 688 and 688Is) and forward-fit the *Virginia*-class ships. They will provide greater capability than the current TB-23 Thin-Line towed arrays and will be more supportable because of commonality throughout the fleet. Coupled with the submarine A-RCI Phase II system, TB-29A arrays are expected to provide the same 400-500 percent increase in detection capability against submerged platforms as the current TB-29 has demonstrated. Technical Evaluation is scheduled for the TB-29A in FY 2001, and Operational Evaluation will follow in FY 2002 after the first three arrays are delivered to the fleet.

These new sonar sensors with such superior detection capabilities must be coupled with more sophisticated – and more flexible – signal processing. The **Acoustic Rapid COTS Insertion (A-RCI) Program** is a multi-phase development that is supplanting existing legacy submarine sonar systems with a common, more capable and flexible COTS-based Open Systems Architecture (OSA) on SSN-688-, SSN-688I-, SSN-21-, and SSBN-726-class submarines. The powerful A-RCI Multi-Purpose Processor (MPP) allows development and use of complex algorithms that were previously well beyond the capability of legacy processors. More importantly, COTS-based processors and OSA technology and systems allow onboard computer power to grow at nearly the same rate as commercial industry's, and will enable regular updates to both software and hardware with little or no impact on submarine scheduling.

A key facet of the A-RCI program (designated AN/BQQ-10) is the **Submarine Precision Underwater Mapping and Navigation (PUMA)** upgrade. These software-processing improvements will provide submarines with the capability to map the sea bottom and register geographic and mine-like features. This ability to map the ocean floor and display the results in three dimensions will allow submarines to conduct covert battlespace preparation of the sea floor, as well as minefield surveillance and avoidance, with impunity.

A-RCI Phase II (FY 1999) provided substantial towed and hull array software and hardware processing improvements that significantly improved low-frequency detection capability. Phase III (FY 2001) augments the current Digital Multi-Beam Steering (DIMUS) processing on the Spherical Array with a linear beamformer and enhanced processing that improves medium frequency detection capability. Phase IV (FY 2001) will upgrade the high frequency sonar on late-generation SSN-688I-class ships. Each upgrade installs improved processing and workstation interfaces and built-in training software. Recent, real-world encounters have consistently demonstrated the overwhelming success of this program in restoring and maintaining U.S. acoustic superiority against likely adversaries.

The sonar team aboard USS *San Juan* (SSN-751) conducts Acoustic Rapid COTS Insertion training.

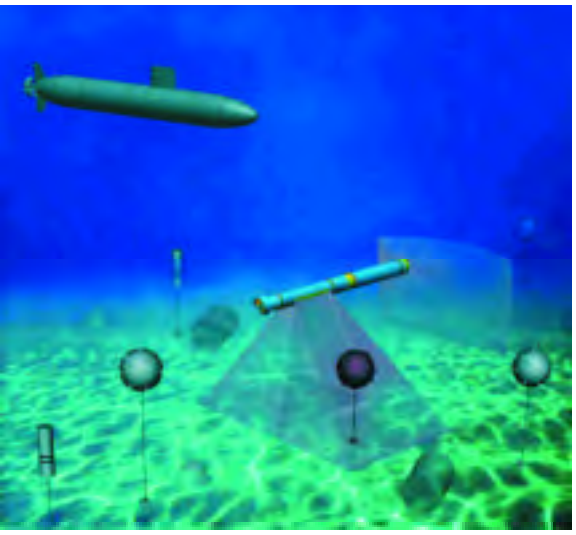
Submarine combat control – or fire control – systems are also being upgraded and improved. Older legacy systems will have a more common, capable, and flexible open architecture under the **Submarine Combat Control System Open System Enhancement Program**. This program will be implemented in three phases. Phase I (FY 2000) introduces automated strike planning capabilities of the Tomahawk Weapons Control System (ATWCS), currently employed on strike capable surface ships, and an upgrade to *Virginia*-class-like data distribution and services. Phase II (FY 2002) further upgrades the processing capability and introduces advanced weapons improvement. This upgrade supports the Tactical Tomahawk (TACTOM) Weapon Control System (TTWCS) and the improved anti-diesel littoral torpedo (ADCAP CBASS). Later, Phase III (FY 2007) installs *Virginia*-class weapons-launch improvements and provides an at-sea, end-to-end launcher testing capability. The first Mk 2 Block 1C installation on a *Los Angeles*-class submarine has already been completed, with developmental and operational testing to support IOC scheduled for FY 2001.

The **BSY-2 Submarine Combat System** was designed to meet the expanded operational requirements of the *Seawolf* (SSN-21)-class attack submarines. The system is fully integrated for sonar tracking, monitoring, and launch of all on-board weapons, including Mk 48 ADCAP/ADCAP MOD torpedoes, Tomahawk missiles, and mines. Significant advancements include the hull-mounted Wide Aperture Array (WAA) for rapid localization of targets, a 92-processor node flexible architecture ("FLEXNET"), and a fully integrated Interactive Electronic Technical Manual (IETM) supporting on-board and shore-based maintenance, operations, and training. Three systems have

been procured, with the first delivered to the *Seawolf* in February 1995, the second to *Connecticut* in October 1997, and the third intended for *Jimmy Carter*.

NON-ACOUSTIC SENSORS

The increasing demands on submarines for near-land ISR has raised electro-magnetic sensors to new levels of importance. The **AN/BLQ-10 Electronic Support Measures (ESM) Suite,** formerly known as Advanced Submarine Tactical ESM Combat System (ASTECS), will be deployed on the *Los Angeles, Seawolf*, and *Virginia* classes and will support operations in both the open ocean and in the complex littoral signals environment. The system consists of periscope-mounted antennas, broadband receivers, signal detectors, displays, and advanced processing and analysis equipment. The BLQ-10 will detect, analyze, and identify radar and communication signals from ships, aircraft, submarines, and land-based transmitters. Additionally, it includes a powerful radio direction-finding subsystem and will provide our ships an enhanced littoral intelligence-gathering capability, particularly when augmented with special carry-on signals intelligence (SIGINT) equipment. The AN/BLQ-10 ESM System entered development in October 1994, and successfully passed OPEVAL in June 2000.



LMRS will Offer New Mine Ops Capabilities. The Long-Term Mine Reconnaissance System will enable submarines to conduct clandestine minefield reconnaissance by launching and recovering a vehicle able to operate autonomously for more than 40 hours.

Another exciting new technology for information gathering in coastal regions is that of **Unmanned Undersea Vehicles (UUVs)** — particularly those that can be launched and retrieved by submarines standing farther out to sea. The Navy's first priority in its current UUV plan is the rapid development and deployment of a covert mine reconnaissance capability. The **Long-Term Mine Reconnaissance System (LMRS)** is in development to enter service in FY 2003 and will enable submarines to conduct clandestine minefield reconnaissance by launching and recovering a vehicle able to operate autonomously for more than 40 hours. Potential preplanned product improvement (P3I) enhancements are being reviewed to expand LMRS capabilities with Precision Underwater Mapping and Navigation and more cost-effective rechargeable energy sources. The **Multi-Mission UUV Program**, an outgrowth of LMRS, is scheduled to start in FY 2004. This initiative is envisioned as building on the LMRS design by adding "plug and play" sensor packages for potential missions in electro-magnetic and electro-optical ISR, Indications and Warning, tactical oceanography, and remote ASW tracking.

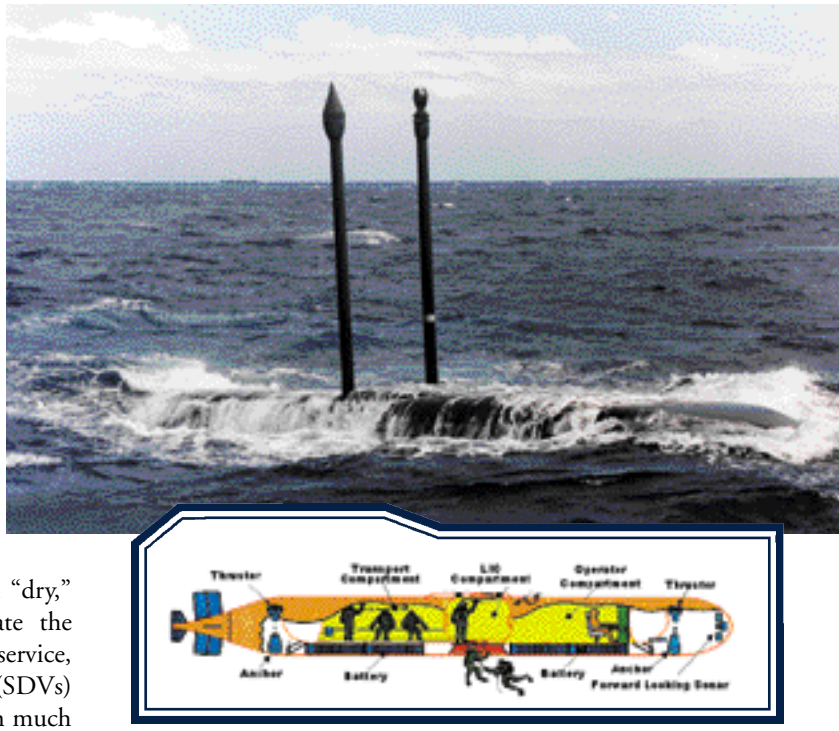
ENHANCED COMMUNICATIONS

A key requirement for expanding the role of attack submarines in both intelligence gathering and joint operations is achieving an order of magnitude increase in communications connectivity. The **High Data-Rate (HDR) Antenna** will provide the Submarine Force with world-wide, high data-rate satellite communications for accessing the secure, survivable Joint MILSTAR Satellite Program in the Extremely High Frequency (EHF) band, as well as the Defense Satellite Communications System (DSCS) in the Super High Frequency (SHF) frequency band. The HDR antenna can also copy targeting information from the Global Broadcast Service (GBS). The first Rapid Prototype HDR Antenna was delivered to the Navy in June 1998 and has successfully completed testing. The first operational installation was completed on USS *Providence* (SSN-719) in August 2000 and has already demonstrated a significant improvement in submarine connectivity. Operational Evaluation is currently ongoing.

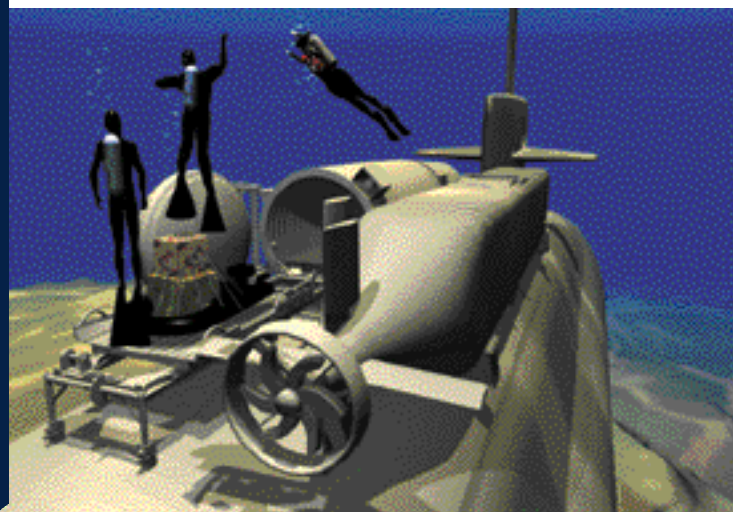
HDR Offers New Connectivity. The first operational installation of the Navy's new High Data Rate (HDR) Antenna was completed on USS *Providence* (SSN-719) in August 2000 and has already demonstrated a significant improvement in submarine connectivity.

If Deterrence Fails — and Conflict Escalates…

Submarines already on scene for the ISR stages of a contingency are both well-positioned and well-prepared to support U.S. interests if the tactical situation escalates toward armed conflict. The first overt military action required of nearby submarines might be the insertion of Special Operations Forces (SOF) for covert missions in hostile territory. The new **Advanced SEAL Delivery System (ASDS)** is particularly designed for assignments of this type. This dry mini-submarine is 65 feet long and is operated by a two-man crew. It can carry a Navy Sea-Air-Land (SEAL) squad or similar teams from the other services for long-range clandestine insertions and extractions in support of special operations missions. ASDS will be launched either from a host submarine, much like the **Deep Submergence Rescue Vehicle (DSRV)**, or from the well decks of amphibious ships. Essentially, a "dry," battery-powered mini-submarine, it will eliminate the extended cold-water exposure inherent with in-service, "wet," submersible Swimmer Delivery Vehicles (SDVs) and will bring SOF team members into action with much less physical and mental fatigue.



Advanced SEAl Delivery System



Artist's conception of swimmer operations from an SSGN.

The U.S. Special Operations Command has funded all the ASDSs now planned for procurement. The first is homeported with SEAL Delivery Team One (SDVT ONE) in Pearl Harbor, Hawaii, and is currently undergoing at-sea operational testing. Follow-on ASDSs are scheduled to be homeported in Hawaii and in Little Creek, Virginia (with SDVT TWO), and modifications to allow in-service submarines to host the vehicles are underway.

NEW TORPEDO DEVELOPMENTS

If a shooting war breaks out at sea, the primary underwater offensive weapon of the Submarine Force is the **Mark 48 Heavyweight Torpedo**, effective against both surface ships and hostile submarines. This 21-inch diameter weapon has been in production since February 1972, and is carried by both attack and ballistic missile submarines.

An improved **Mark 48 Advanced Capability (ADCAP) Torpedo** is now fielded on the *Seawolf-, Los Angeles-, Sturgeon* (SSN-637)-class, and *Ohio* (SSBN-726)-class submarines; it will also arm the *Virginia*-class attack submarines. A modification to the ADCAP (ADCAP MOD) will increase guidance/control speed and memory, and significantly reduce radiated noise. Both versions will combat fast, deep-

Commanding Officers
Pacific Fleet

Kamehameha (SSN-642)	CDR Ed Seal
Parche (SSN-683)	CDR Mark Gorenflo
L. Mendel Rivers (SSN-686)	CDR David Portner
Los Angeles (SSN-688)	CDR Chris Thomas
Bremerton (SSN-698)	CDR Brian Nutt
La Jolla (SSN-701)	CDR Mike McLaughlin
Portsmouth (SSN-707)	CDR James Low
Houston (SSN-713)	CDR Dan Mack
Buffalo (SSN-715)	CDR Ralph Ward
Salt Lake City (SSN-716)	CDR Steve Marr
Olympia (SSN-717)	CDR Bob Brennan
Honolulu (SSN-718)	CDR John Richardson
Chicago (SSN-721)	CDR Daniel Prince
Key West (SSN-722)	CDR Chuck Merkel
Louisville (SSN-724)	CDR Russell Janicke
Helena (SSN-725)	CDR Timothy Bertch
Ohio (SSBN-726)(Blue)	CDR Joe Cereola
Ohio (SSBN-726)(Gold)	CDR James White
Michigan (SSBN-727)(Blue)	CDR Brian Coval
Michigan (SSBN-727)(Gold)	CDR Dieritch Kuhlmann
Florida (SSBN-728)(Blue)	CDR Jeff Powers
Florida (SSBN-728)(Gold)	CDR Kevin Torcolini
Georgia (SSBN-729)(Blue)	CDR Chris Ratliff
Georgia (SSBN-729)(Gold)	CDR D. T. Norris
Henry M. Jackson (SSBN-730)(Blue)	CDR Paul Ims
Henry M. Jackson (SSBN-730)(Gold)	CDR R. Aronson
Alabama (SSBN-731)(Blue)	CDR Tom Wears
Alabama (SSBN-731)(Gold)	CDR Terry Wichert
Alaska (SSBN-732)	CDR Kenneth Voorhees
Nevada (SSBN-733)	CDR Walter Luthiger
Pasadena (SSN-752)	CDR Mark Ginda
Topeka (SSN-754)	CDR John Litherland
Asheville (SSN-758)	CDR Kerry Ingalls
Jefferson City (SSN-759)	CDR Ron Steed
Columbus (SSN-762)	CDR Norm Moore
Santa Fe (SSN-763)	CDR David Marquet
Charlotte (SSN-766)	CDR Tom Bailey
Tucson (SSN-770)	CDR Bill Traub
Columbia (SSN-771)	CDR Bill Drake
Greeneville (SSN-772)	CAPT Tony Cortese
Cheyenne (SSN-773)	CDR Bill Stacia
Dolphin (AGSS-555)	CDR Stephen Kelety
Frank Cable (AS-40)	CAPT Scott Spencer
ARCO (ARDM-5)	LCDR Glenn Little
Deep Submergence Unit	CDR H. David Clopp

Integrated Undersea Surveillance (IUSS)
Commodore CAPT Neil E. Rondorf

Joint Maritime Facility (JMF)
St. Mawgan UK
CAPT Walter Scull

Naval Ocean Processing Facility (NOPF)
Dam Neck, VA
CDR James Donovan

Naval Ocean Processing Facility (NOPF)
Whidbey Island, WA
CDR Carol A. Wilder

Canadian Forces IUSS Centre (CFIC)
Trinity Halifax, Canada
CDR George G. Borgal, Canadian Forces

BANGOR, WA

SUBRON-17
CAPT Tim Giardina

Ohio (SSBN-726)
Michigan (SSBN-727)
Florida (SSBN-728)
Georgia (SSBN-729)
Henry M. Jackson (SSBN-730)
Alabama (SSBN-731)
Alaska (SSBN-732)
Nevada (SSBN-733)

SAN DIEGO, CA

SUBDEVRON-5
CAPT Dale Nees

Parche (SSN-683)
(Homeport in Bangor, WA)
Dolphin (AGSS-555)
Mystic (DSRV-1)

SUBRON-11
CAPT Bruce Smith

Bremerton (SSN-698)
Houston (SSN-713)
Portsmouth (SSN-707)
Salt Lake City (SSN-716)
Helena (SSN-725)
Jefferson City (SSN-759)
ARCO (ARDM-5)

PEARL HARBOR, HI

SUBRON-1
CAPT Rich Snead

Kamehameha (SSN-642)
Los Angeles (SSN-688)
La Jolla (SSN-701)
Buffalo (SSN-715)
Charlotte (SSN-766)
Greeneville (SSN-772)

SUBRON-3
CAPT David Thieman

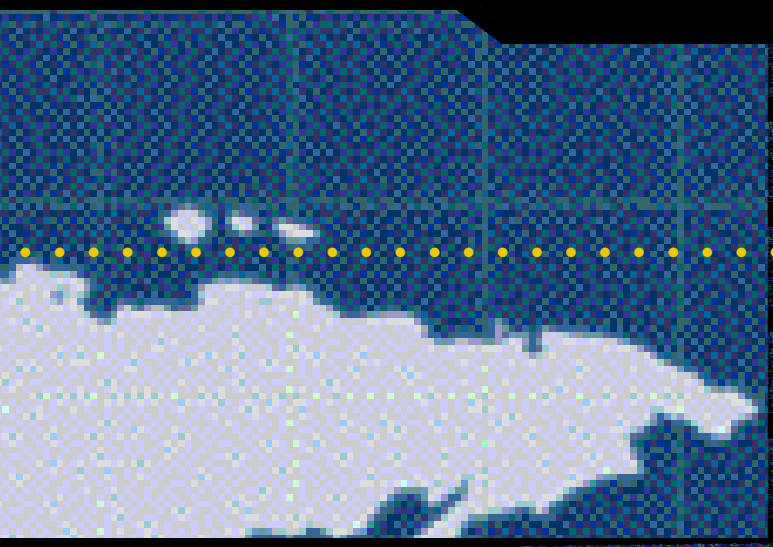
Olympia (SSN-717)
Honolulu (SSN-718)
Chicago (SSN-721)
Key West (SSN-722)
Louisville (SSN-724)
Asheville (SSN-758)
Columbia (SSN-771)

SUBRON-7
Capt Glen Niederhauser

Pasadena (SSN-752)
Topeka (SSN-754)
Columbus (SSN-762)
Santa Fe (SSN-763)
Tucson (SSN-770)
Cheyenne (SSN-773)

GUAM

SUBRON-15
CAPT Dick Corpus



★
COMSUBGRU-9
RADM GEORGE GRIFF
BANGOR, WA

★★★★
USCINCSTR
ADM RICHA
OMAHA, NE

★
COMSUBGRU-7
RADM JOSEPH ENRIGHT
YOKOSUKA, JAPAN

★★
COMSUBPAC
RADM JOHN PADGETT
PEARL HARBOR, HI

USS FRANK CABLE (AS-40)
GUAM

UNITED STATES SUBMA

ITH

★
COMSUBGRU-2
RADM MIKE TRACY
GROTON, CT

RAT
ARD MIES
E

★
COMSUBGRU-8
RADM CHARLES MUNNS
NAPLES, ITALY

USS EMORY S. LAND (AS-39)
LA MADDALENA, ITALY

SUBRON-22
CAPT CHRIS KLYNE

★★★
COMSUBLANT
VADM JOHN GROSSENBACHER
NORFOLK, VA

★
COMSUBGRU-10
RADM GERALD TALBOT
KINGS BAY, GA

RINE FORCE ORGANIZATION

as of JUNE 2001

GROTON, CT

SUBRON-2
CAPT Doug Johnson

Dallas (SSN-700)
Albuquerque (SSN-706)
Pittsburgh (SSN-720)
Springfield (SSN-761)
Toledo (SSN-769)
Submarine NR-1

SUBDEVRON-12
CAPT Scott Van Buskirk

Seawolf (SSN-21)
Philadelphia (SSN-690)
Memphis (SSN-691)
Augusta (SSN-710)
San Juan (SSN-751)
Alexandria (SSN-757)

SUBRON-4
CAPT George Manaske

Connecticut (SSN-22)
Providence (SSN-719)
Annapolis (SSN-760)
Hartford (SSN-768)

SUBGRU-2
CAPT Bill Burke

Jimmy Carter (SSN-23)
City of Corpus Christi (SSN-705)
Miami (SSN-755)
Virginia (SSN-774)
Oak Ridge (ARDM-1)
Shippingport (ARDM-4)

NORFOLK, VA

SUBRON-6
CAPT Frank Drennan

Minneapolis-St. Paul (SSN-708)
Norfolk (SSN-714)
Albany (SSN-753)
Montpelier (SSN-765)
Resolute (AFDM-10)

SUBRON-8
CAPT John Bird

Jacksonville (SSN-699)
Hyman G. Rickover (SSN-709)
San Francisco (SSN-711)
Oklahoma City (SSN-723)
Newport News (SSN-750)
Boise (SSN-764)
Hampton (SSN-767)

KINGS BAY, GA

SUBRON-16
CAPT Dan Sigg

Pennsylvania (SSBN-735)
Kentucky (SSBN-737)
Nebraska (SSBN-739)
Maine (SSBN-741)
Louisiana (SSBN-743)

SUBRON-20
CAPT Al Hochevar

Tennessee (SSBN-734)
West Virginia (SSBN-736)
Maryland (SSBN-738)
Rhode Island (SSBN-740)
Wyoming (SSBN-742)

Commanding Officers

Atlantic Fleet

Seawolf (SSN-21)	CDR Butch Howard
Connecticut (SSN-22)	CDR Fritz Roegge
Jimmy Carter (SSN-23)	CDR Marc Denno
Philadelphia (SSN-690)	CDR Emil Casiano
Memphis (SSN-691)	CDR Rick Breckenridge
Jacksonville (SSN-699)	CDR Mike Brown
Dallas (SSN-700)	CDR Dale Sykora
City of Corpus Christi (SSN-705)	CDR Robert Schmidt
Albuquerque (SSN-706)	CDR Jerry Burroughs
Minneapolis-St. Paul (SSN-708)	CDR John Ferrer
Hyman G. Rickover (SSN-709)	CDR Pete Young
Augusta (SSN-710)	CDR Tim Galpin
San Francisco (SSN-711)	CDR Dave Kern
Norfolk (SSN-714)	CDR Jim Righter
Providence (SSN-719)	CDR Scott Bawden
Pittsburgh (SSN-720)	CDR Jeff Currer
Oklahoma City (SSN-723)	CDR Jamie Foggo
Tennessee (SSBN-734)(Blue)	CDR Al Camp
Tennessee (SSBN-734)(Gold)	CDR Ken Swan
Pennsylvania (SSBN-735)(Blue)	CDR Mike Budney
Pennsylvania (SSBN-735)(Gold)	CDR Ken Perry
West Virginia (SSBN-736)(Blue)	CDR Mike Cortese
West Virginia (SSBN-736)(Gold)	CDR Paul Siegrist
Kentucky (SSBN-737)(Blue)	CDR Pat Seidel
Kentucky (SSBN-737)(Gold)	CDR Mike McKinnon
Maryland (SSBN-738)(Blue)	CDR Stefe Davito
Maryland (SSBN-738)(Gold)	CDR Rusty Smith
Nebraska (SSBN-739)(Blue)	CDR Dave Dittmer
Nebraska (SSBN-739)(Gold)	CDR Paul Healy
Rhode Island (SSBN-740)(Blue)	CDR Vito Menzella
Rhode Island (SSBN-740)(Gold)	CDR Scott Muir
Maine (SSBN-741)(Blue)	CDR John Elnitsky
Maine (SSBN-741)(Gold)	CDR Joe Tofalo
Wyoming (SSBN-742)(Blue)	CDR Jeff Hughes
Wyoming (SSBN-742)(Gold)	CDR John Nicholson
Louisiana (SSBN-743)(Blue)	CDR Mike Byman
Louisiana (SSBN-743)(Gold)	CDR Dave Ruff
Newport News (SSN-750)	CDR Dave Wegmann
San Juan (SSN-751)	CDR John Barnhill
Albany (SSN-753)	CDR Paul Jaenichen
Miami (SSN-755)	CDR Randall Richards
Alexandria (SSN-757)	CDR David Hendricks
Annapolis (SSN-760)	CDR David Bartholomew
Springfield (SSN-761)	CDR Ed Takesuye
Boise (SSN-764)	CDR James Kuzma
Montpelier (SSN-765)	CDR Ron LaSalvia
Hampton (SSN-767)	CDR John Lovering
Hartford (SSN-768)	CDR Robert Kelso
Toledo (SSN-769)	CDR Mike Poirer
Virginia (SSN-774)	CDR Tom Kearney
Submarine NR-1	LCDR William Merz
Emory S. Land (AS-39)	CAPT Lenny Zingarelli
Resolute (AFDM-10)	CDR Steven Cole
Oak Ridge (ARDM-1)	LCDR Bob Tobin
Shippingport (ARDM-4)	LCDR Cie Sielski

T-AGOS Ships

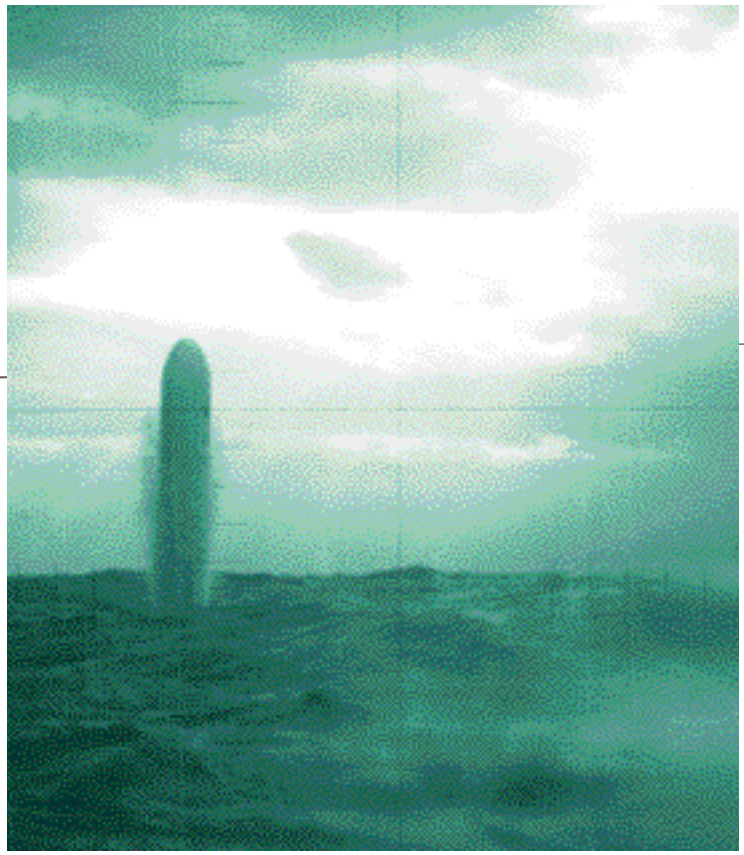
Atlantic Fleet

USNS Able (T-AGOS-20)
USNS Bold (T-AGOS-12)
USNS Loyal (T-AGOS-22)
USNS Prevail (T-AGOS-8)

Pacific Fleet

USNS Assertive (T-AGOS-9)
R/V Cory Chouest
USNS Effective (T-AGOS-21)
USNS Victorious (T-AGOS-19)

United States Submarine Force Organization Map Inside



TACTOM will improve submarine covert precision strike capability.

ASDS... ESSENTIALLY, A "DRY," BATTERY-POWERED MINI-SUBMARINE, IT WILL ELIMINATE THE EXTENDED COLD-WATER EXPOSURE INHERENT WITH IN-SERVICE, "WET," SUBMERSIBLE SWIMMER DELIVERY VEHICLES (SDVs) AND WILL BRING SOF TEAM MEMBERS INTO ACTION WITH MUCH LESS PHYSICAL AND MENTAL FATIGUE.

diving nuclear submarines and high-performance surface ships and can operate with or without wire guidance using active and/or passive homing and pre-programmed search and attack procedures.

A follow-on hardware upgrade, known as the **Common Broadband Advanced Sonar System (CBASS)**, began development in FY 1998 and will further enhance the torpedo's performance against modern SSNs and SSKs employing advanced countermeasures. ADCAP MOD upgrade production began in FY 1995, and between FY 2000 and FY 2004, a total of 522 will be completed. CBASS MODs are scheduled for implementation on 675 torpedoes between FY 2003 and 2007.

TOMAHAWKS FOR LAND ATTACK

If the developing scenario ashore demands a precision strike against critical targets early in the conflict, U.S. submarines are equipped to fire the **A/N BGM-109 Tomahawk Land-Attack Missile (TLAM)** from either torpedo tubes or vertical launchers. From their unique vantage point close to hostile coasts, submarines can often launch in complete surprise from under the enemy's air-defense umbrella and depend on a short time of flight to increase the overall accuracy and effectiveness. TLAM is the Navy's premier, all-weather, long-range, subsonic land-attack cruise missile, and it is deployed on surface warships as well. The TLAM/C variant is armed with a unitary conventional warhead, while the TLAM/D variant is armed with submunitions. TLAM is guided by an on-board Inertial Navigation System (INS) and Terrain Contour Matching (TERCOM) system, which correlates observed terrain contours with a map stored onboard to determine where the missile is. Additional accuracy is attained through multiple Digital Scene Matching Area Correlation (DSMAC) updates, which take digital pictures of the terrain and compare them with stored digital maps. The TLAM Block III upgrade improves accuracy and global strike capability with the addition of Global Positioning System (GPS) guidance capability and improved DSMAC IIA.

The awesome power of the submarine-launched Mark 48 ADCAP Torpedo is clearly illustrated as it tears through a former destroyer escort during a combat systems test conducted by the Australian Navy.

Tactical Tomahawk (TACTOM), the Block IV upgrade to TLAM, will preserve Tomahawk's long-range precision-strike capability while significantly increasing responsiveness and flexibility at significantly lower cost. The follow-on TACTOM improvements include in-flight retargeting, the ability to loiter over the battlefield to respond to emergent targets, satellite "backlinking" for battle damage assessment (BDA), and a new family of alternative payloads. The TACTOM program was initiated in FY 1998 and will reach IOC in FY 2003. Current plans call for the Navy to procure 1,353 TACTOM variants.

Undersea Warfare and the MRC

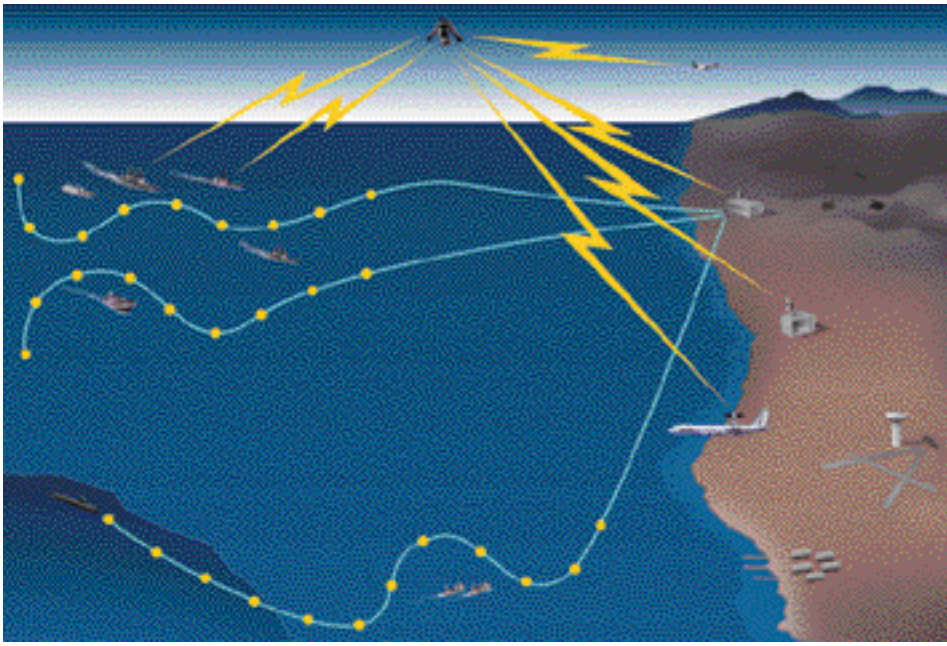
In the event of a Major Regional Contingency (MRC) – either without warning or as the result of the failure of deterrence and the escalation of conflict – the attack submarine force will quickly become heavily tasked within the context of either joint or combined operations. In addition to continuing ISR missions now expanded to include Battle Damage Assesment (BDA), U.S. submarines will take the predominant part in "sanitizing" the undersea battlespace in preparation for the arrival of follow-on joint forces by sea. Similarly, their close-in precision strike capability will be called on frequently to neutralize enemy command and control nodes, time-critical targets, and hostile air defenses, thus preparing the way for manned aircraft strikes from aircraft carriers or forward bases. A major new initiative in this area is the proposal to convert four older *Ohio*-class SSBNs – excess to the impending START treaty limits – to SSGNs capable of carrying up to 154 TLAMs or TACTOMs in their reconfigured vertical-launch tubes, more than any other warship in the Navy. This would provide the U.S. with an unmatched combat power that is covert, survivable, forward deployed, and has a nearly unlimited endurance.

UNDERSEA SURVEILLANCE

Securing and maintaining control of the sea, both in an MRC's operational area and along the sea lines of communication (SLOCs) that support joint forces, requires effective means of detecting and interdicting enemy threats, surface and subsurface. The *sine qua non* of this capability is pervasive surveillance – of both large ocean areas and specified regions of particular importance. Largely as an outgrowth of the enormous effort expended on ASW during the Cold War, a number of new sensor and surveillance systems are coming on line.

A major asset in this context is our fleet of **T-AGOS Ocean Surveillance Ships** – small, civilian-manned auxiliary towed-array vessels that play a prominent role in augmenting the Navy's overall anti-submarine warfare capability. There are eight total ships in three classes: a three-ship monohull *Stalwart* (T-AGOS-1) class, a four-ship twin-hull *Victorious* (T-AGOS-19) class, and a single leased vessel, the R/V *Cory Chouest*. The *Victorious* class is a Small Waterplane Area Twin-Hull (SWATH) design that allows the ships to operate in relatively high seas.

T-AGOS ships provide the platform for the **Surveillance Towed Array Sensor System (AN/UQQ-2 SURTASS).** The SURTASS ships provide passive detection of quiet nuclear and diesel submarines and real-time reporting of surveillance information to theater commanders. For passive sensors, they employ either a long-line passive sonar acoustic array or a shorter twin-line passive acoustic array. The twin-line system is our best operational shallow-water towed



ADS – Valuable to Littoral Surveillance. The Advanced Deployable System (ADS) is a passive acoustic undersea surveillance system designed for rapid deployment in littoral areas for the detection, classification, localization, and tracking of both underwater and surface targets.

U.S. SUBMARINES WILL TAKE THE PREDOMINANT PART IN "SANITIZING" THE UNDERSEA BATTLESPACE IN PREPARATION FOR THE ARRIVAL OF FOLLOW-ON JOINT FORCES BY SEA.

T-AGOS Ocean Surveillance Ships like USNS *Loyal* (T-AGOS-22) are small, civilian-manned auxiliary towed-array vessels that play a prominent role in augmenting the Navy's overall anti-submarine warfare capability.

array and the only multi-line towed array in the Navy. It consists of a pair of arrays towed side-by-side from a SURTASS ship and offers significant advantages for undersea surveillance operations in the littoral zone. It can be towed in water as shallow as 180 feet, provides significant directional noise rejection, resolves bearing ambiguities without turning, and allows the ship to tow at higher speed. The twin-line Engineering Development Model is currently installed on the USNS *Assertive* (T-AGOS-9), and the first production model has been installed on the USNS *Bold* (T-AGOS-12).

With a **Low Frequency Active (LFA)** add-on to SURTASS, the system is capable of making long-range detections of both submarines and surface ships using a low frequency active sonar transmitter suspended beneath the T-AGOS ship. As a mobile system, SURTASS/LFA can be employed as a force-protection sensor wherever the force commander directs, including forward operating areas or in support of battle group activities. Only one LFA system exists, currently installed on board the R/V *Cory Chouest*. LFA will be transitioned to USNS *Impeccable* (T-AGOS-23), a single large (5,500-ton) SWATH ship designed specifically as a platform for the SURTASS towed array and its LFA adjunct, when it becomes operational in FY 2002. Efforts to develop smaller and lighter LFA-type active systems are ongoing.

FIXED ACOUSTIC SURVEILLANCE

For conducting acoustic surveillance and monitoring in delimited geographical areas of interest, two innovative new systems are under development. The **Advanced Deployable System (ADS)** is a rapidly deployable, short-term, large-area undersea surveillance asset, designed to detect, locate, and report quiet conventional and nuclear submarines in shallow-water littoral environments. ADS will consist of a Processing and Analysis Segment (PAS) contained in reusable, transportable vans and connected to the ADS sensor field by a shore cable. The Underwater Segment (UWS) is an expendable, battery-powered, wide-area field of passive undersea arrays. ADS will provide threat location information directly to tactical forces and contribute to the joint force commander's real-time maritime picture in areas where timely surveillance is needed to maintain undersea battlespace dominance.

ADS is in the Engineering and Manufacturing Development phase following a highly successful May 1999 Fleet Exercise Test that demonstrated the capability to detect and track a quiet diesel-electric submarine and provide real-time cueing information to tactical platforms. Incremental capability builds will provide a Trip Wire in FY 2003, a Small Field in FY 2004, and Large Field in FY 2006.

On a somewhat larger scale is the **Fixed Distributed System (FDS)**, intended as a fixed, long term, passive-acoustic, ocean-bottom surveillance system. Currently under development is a more modern variant of FDS, called **FDS-COTS,** which will make maximum use of COTS components to upgrade the existing capability. Both versions consist of a series of arrays deployed on the ocean floor in deep-ocean areas, across straits and other chokepoints, or in strategic shallow-water littoral areas. Both also include two components: the Shore Signal and Information Processing Segment (SSIPS) that handles the processing, display, and communication functions; and the Underwater Segment consisting of a large area distributed field of acoustic arrays. The initial FDS program was suspended in 1993 following the deployment of the first system, designated FDS-1. Additional planned systems were cancelled due to high costs relative to the perceived threat after the breakup of the Soviet Union, and FDS-COTS was developed as a less-expensive follow-on version. Development of an all-fiber-optic hydrophone passive array will increase system reliability and performance, and may also reduce costs. System testing and evaluation are complete, and a contract is in place for the production of the next generation of underwater systems.

Photo by JO1 Jason E. Miller

Deep submergence rescue vehicles, like *Mystic* (DSRV-1) pictured above aboard USS *Dallas* (SSN-700), continue to provide the U.S. and its allies a worldwide, quick-response submarine rescue capability unmatched by any other nation.

Strategic Deterrence

The TRIDENT II (D5) missile.

While the Navy's attack submarines prepare for participation in a wide range of potential littoral and expeditionary contingencies, the nation's ballistic missile submarines – the SSBNs – continue their quiet strategic deterrence patrols – day in and day out – with little publicity or fanfare. The ultimate guarantors of the international security of the United States, they have performed this mission with proud dedication and near-perfect proficiency since 1960. The future of our seaborne nuclear deterrent rests on two key elements: the SSBN force and the TRIDENT missile system.

The **USS *Ohio* (SSBN-726)-class TRIDENT Fleet Ballistic Missile Submarines (SSBN)** comprise the Navy segment of the nation's strategic triad, which also includes long-range manned bombers and land-based intercontinental ballistic missiles. The SSBN is the most survivable and enduring leg of the triad, and thus remains one of the Navy's highest policy, program, and operational priorities. All 18 of the *Ohio*-class SSBNs have been commissioned; the final ship of the class, the USS *Louisiana* (SSBN-743), joined the fleet in FY 1997. The *Ohio*-class submarines each carry 24 TRIDENT missiles – TRIDENT I/C4s on the first eight ships stationed in Bangor, Washington, and TRIDENT II/D5s on the ten ships stationed in Kings Bay, Georgia. Conversion of four of the C4 ships to carry the TRIDENT II/D5 missile began in FY 2000 and will be completed in FY 2008, with USS *Alaska's* (SSBN-732) and *Nevada's* (SSBN-733) conversion currently in progress. The first four *Ohio*-class submarines are scheduled for inactivation starting in 2003 to comply with the 1994 Nuclear Posture Review target of 14 SSBNs. USS *Pennsylvania* (SSBN-735) and USS *Kentucky* (SSBN-737) will shift home port from Kings Bay, GA to Bangor, WA in 2003 to balance the strategic force.

THE SSBN IS THE MOST SURVIVABLE AND ENDURING LEG OF THE TRIAD, AND THUS REMAINS ONE OF THE NAVY'S HIGHEST POLICY, PROGRAM, AND OPERATIONAL PRIORITIES.

The UGM-133A TRIDENT II/D5 Submarine-Launched Ballistic Missile is the sixth generation of the U.S. Navy's Fleet Ballistic Missile (FBM) program, which started in 1955. The D5 is a three-stage, solid-propellant, inertially-guided, submarine-launched ballistic missile (SLBM) with a range greater than 4,000 nautical miles and accuracy measured in hundreds of feet. TRIDENT II missiles are capable of carrying W76 or W88 Multiple Independently Targeted Reentry Vehicles (MIRVs). In operation, these missiles have been declared at eight MIRV warheads under the Strategic Arms Reduction Treaty (START). As the Navy continues to address future deterrence requirements against weapons of mass destruction, the TRIDENT II/D5 will ensure that the United States has a modern, survivable strategic deterrent.

TRIDENT II/D5 missile construction continues with an inventory objective of 425 missiles for 14 TRIDENT II/D5 SSBNs in two oceans. Planned procurement through FY 2005 is 5 to 12 missiles per year.

Despite a dramatic downsizing in the decade since the Cold War, today's Submarine Force is responding to the volatile demands of the 21st century by designing-in flexibility, both in computer and sensor systems and in hull and mechanical systems. Exciting new programs for ships, sensors, and weapons are already in place both to revitalize our existing force structure, and to bring on-line an entirely new generation of submarines specifically suited for the expeditionary missions of the new millennium.

The USS *Alexandria* (SSN-757) underway.

Regulus

America's First Sea-borne Nuclear Deterrent

by Edward C. Whitman

As the Cold War intensified in the decade following World War II, and particularly with the Soviet Union's success in matching the United States in developing atomic weapons, nuclear deterrence became a key element of global diplomacy. By the early 1950s, both superpowers had deployed large manned bomber forces capable of reaching each other's homelands with either forward basing or aerial refueling, and additionally, the United States had begun to deploy atomic weapons on aircraft carriers.

Regulus Roars. The nuclear-powered guided missile submarine USS *Halibut* (SSGN-587) sends a Regulus I missile skyward. The sleek, turbojet-powered missile packed a nuclear warhead and had been operational in the fleet since 1955. In the background is the aircraft carrier USS *Lexington* (CV-16).

Early Efforts. The United States and Soviet Union were both quick to take advantage of captured German V-1 and V-2 technology from World War II to begin development of their own guided and ballistic missiles. German successes in fielding long-range missiles and increasing concern with the growth of Soviet power after the war led to experimentation with launching strategic missiles from submarines in the late 1940s. Above, USS *Carbonero* (SS-337) launches a Loon – the U.S. ramjet missile patterned after the German V-1.

1940's (late)

SSG Conversion. USS *Tunny* (SSG-282) was the first submarine to carry the Regulus I missile. Originally a World War II fleet submarine launched in 1942 – and already twice decommissioned – *Tunny* was converted to a guided missile submarine in early 1953. Above, *Tunny* is hidden in a billowy smoke trail as a Regulus I missile shoots skyward.

1953

Regulus II. Nearly twice as large as Regulus I, the second-generation Regulus II was capable of reaching 1,200 nautical miles at Mach 2. By late 1955, the Navy had long-range plans to launch as many as 23 Regulus II submarines, but even though Regulus II proved successful in final testing, budgetary pressures kept it from ever being deployed.

1955

Both sides were also quick to take advantage of captured German V-1 and V-2 technology from World War II to begin development of both guided and ballistic missiles for tactical and strategic use, with the U.S. Army initially taking the lead in the United States. Not to be out-done, the U.S. Navy converted two World War II fleet boats, USS *Carbonero* (SS-337) and USS *Cusk* (SS-348) to carry a U.S. variant of the German V-1 pulse-jet missile, known as the Loon, first launched at sea in February 1947. Loon's nominal range under command guidance was approximately 50 nautical miles, but using a second submarine as a relay, it could be effective out to 135 nautical miles, with a reported Circular Error Probable (CEP) of 6,000 yards.

By this time, the Navy had also let development contracts for two more ambitious bombardment missiles, the supersonic Grumman Rigel (SSM-N-6) and the subsonic Chance-Vought Regulus (SSM-N-8), each intended to carry a 3,000 pound warhead for 500 nautical miles. Although Rigel fell by the wayside in 1953, Regulus was successfully developed into America's first sea-going nuclear deterrent and was first deployed on the heavy cruiser USS *Los Angeles* (CA-135) in 1955. Eventually, five submarines were fitted to carry and launch Regulus also, and they became the principal deterrent force.

The Regulus I missile itself was essentially a small turbojet aircraft, 42 feet long, with a wingspan of 21 feet. Gross launch weight was just under seven tons, including a ton of fuel, and its Allison J33-A-14 engine could propel the missile to Mach 0.91 (about 550 knots). Regulus was launched from an inclined ramp – later trainable – and it required two 3,300 pound-thrust Jet Assisted Take-Off (JATO) units to get up to speed. The weapon was command-guided, initially out to the radar horizon by superimposing steering commands onto the launch platform's tracking radar waveform, and then by using a relay submarine nearer the target to track and steer the missile to the final aim point. Either a 40-50 kiloton nuclear warhead or a 1-2 megaton thermonuclear device could be carried.

USS *Tunny* (SSG-282) was the first submarine to carry Regulus. Originally a World War II fleet submarine of the *Gato* class, *Tunny* was launched in June 1942, completed nine war patrols, and earned nine battle stars in the Pacific war. Decommissioned in December 1945, she was briefly recommissioned in reserve for the Korean War, decommissioned again, but then brought out in early 1953 for conversion to a guided missile submarine (SSG). This consisted of deck-mounting a large, pressurized, cylindrical hangar, some 15 feet in diameter, just abaft the sail, with a collapsible ramp extending aft. The hangar could accommodate two Regulus I missiles in a rotating ring arrangement. The weapons could be checked out while the submarine was still submerged by entering the hangar through an access trunk, but actual launching required the submarine to surface and manhandle the weapon onto the rails before it could be fired. Then, the boat would have to remain at least at periscope depth to guide the missile to the radar horizon.

Tunny's conversion moved quickly by today's standards, and she fired her first Regulus at sea in July 1953. For the next several years, *Tunny* operated out of Point Mugu, California, primarily as a Regulus test platform. In October 1955, USS *Barbero*, originally SS-317 and also a World War II fleet boat, was commissioned as the Navy's second SSG, having been brought out of mothballs and provided by the Mare Island Naval Shipyard with a cylindrical hangar identical to Tunny's. After work-ups off the coast of California, *Barbero* transited the Panama Canal in April 1956 and joined the Atlantic Fleet.

By this time, Regulus was also at sea on four heavy cruisers: In addition to *Los Angeles*, already mentioned, *Helena* (CA-75), *Toledo* (CA-133), and *Macon* (CA-132) were all fitted with fantail launching rails and commenced regular operational deployments, the first three in the Pacific, and *Macon* in the Atlantic. Even ten aircraft carriers were equipped to launch the missile, depending on an escorting aircraft to provide mid-course guidance, but although at least one Pacific deployment occurred, the resulting onboard mix of missiles and manned aircraft was never popular with the aviation community.

In mid-1956, it became Navy policy to keep one SSG in each ocean, and *Tunny* shifted her base of operations to Pearl Harbor in 1957. Meanwhile, the Navy

Made to Order. By mid-1958, USS *Grayback* (SSG-574) and USS *Growler* (SSG-577) had been commissioned as the first diesel-electric submarines specifically designed to carry Regulus missiles. At that time, the Navy had four SSGs and four missile-carrying cruisers at sea. Above, *Growler's* large bow hangars, where she could carry four Regulus I missiles, are clearly seen as the ship's most prominent feature.

1958

Nuclear Power. USS *Halibut* was the first nuclear powered submarine specifically designed to carry and launch missiles. Commissioned in January, 1960, she could carry four Regulus II or five Regulus I missiles in her hangar, which also served as a forward torpedo room.

Final Years. The advent of compact nuclear warheads and large solid-fuel rocket motors in the late 1950s quickly brought an end to the Regulus era. Combined with the new *George Washington* (SSBN-598)-class submarine, the Polaris missile eliminated all the disadvantages of the Regulus system.

1960

had laid down two large diesel-electric submarines specifically to carry Regulus, launching USS *Grayback* (SSG-574) in March 1958 and USS *Growler* (SSG-577) in August of that same year. Each of these two near-sister ships – displacing approximately 3,600 tons submerged – could accommodate a total of four Regulus I missiles in a pair of cylindrical hangars set into the large, bulbous bow. These hangars opened aft through a set of doors by which the weapons could be moved onto a trainable launch ramp set into a well forward of the sail. The ramp was rotated athwartships for launching.

After the Soviet Union and then the United States successfully tested their first intercontinental ballistic missiles (ICBMs) in 1957, the nuclear arms race moved into a more dangerous phase. In late 1958, with four SSGs and four Regulus cruisers in commission, the Navy responded by moving all of the submarines and three of the cruisers to the Pacific to maintain regular deterrent patrols threatening the Soviet Far East. In particular, Submarine Squadron ONE was formed of the four SSGs at Pearl Harbor and adopted a readiness posture that put at least four missiles on station in the Western Pacific at all times, to complement existing carrier-based aircraft armed with nuclear weapons. (This required deploying either the two converted fleet boats together or one of the two *Graybacks*.) *Tunny* departed on the first of these regularly scheduled deterrent patrols in October 1959, whereas *Grayback's* and *Growler's* first patrols commenced in early 1960.

Some years earlier, though, the Navy had already directed Chance Vought to start developing a second-generation, supersonic Regulus II missile, capable or reaching 1,200 nautical miles at Mach 2. Nearly twice as large as Regulus I, the new weapon demanded a somewhat larger submarine to carry it. Several alternative platform designs were studied, including one capable of carrying four Regulus II or eight Regulus I missiles in a large hangar forward. Ultimately, funding for building a new SSG was included in the FY 1956 budget. Moreover, by late 1955, Navy long-range planners were anticipating that as many as 23 Regulus II submarines would eventually be required. Earlier that same year, however, the Navy's nuclear propulsion program had come to fruition with USS *Nautilus* (SSN-571) "underway on nuclear power." Consequently, the first planned Regulus II SSG was reordered as a nuclear-powered submarine, laid down at Mare Island in April 1957, and commissioned as USS *Halibut* (SSGN-587) in January 1960.

Halibut, 350 feet long overall and displacing nearly 4,900 tons submerged, was fitted with what was then the standard attack submarine power plant, driving two screws. Her enormous single missile hangar was set deep into the outer hull forward, and sloped upward and aft to penetrate the deck, where a large, vertically-opening door gave access to a turntable launcher forward of the sail. The hangar space could hold four Regulus II or five Regulus I missiles and also doubled as a forward torpedo room. This large, single-door hangar – potentially open to the sea during the launching evolution – constituted a serious vulnerability. If it flooded, the ship might easily sink.

Halibut entered active service with the Pacific Fleet in November 1960 and made her first formal patrol early the next year, joining the four SSGs in the rotation necessary to keep four strategic missiles continually on station. By then, the heavy cruisers had been withdrawn from the Regulus mission – with *Los Angeles* the last to go in 1961 – leaving the submarines to carry on alone. Somewhat ironically, even though Regulus II proved successful in final testing, budgetary pressures prevented any subsequent procurement, and it was never deployed. Thus, for the entire era of these first sea-borne deterrent patrols, the subsonic Regulus I remained the weapon of choice.

In fact, the synergy of two new military technologies – compact nuclear warheads, and large solid-fuel rocket motors – spelled a quick end to the Regulus era. Together, they made possible the design of relatively small solid-fuel missiles capable of carrying nuclear warheads over intercontinental distances – and thus established the feasibility of the submarine-launched ballistic missile (SLBM). Accordingly, the Navy's Special Projects Office was established in November 1955 and, under RADM William F. Raborn, moved rapidly to develop the Polaris SLBM and a class of nuclear-powered ballistic missile submarines to carry it. Only five years later, just as *Halibut* was joining the Pacific Fleet in

November 1960, the first of the new class, USS *George Washington* (SSBN-598), departed on her maiden Polaris patrol in the Atlantic.

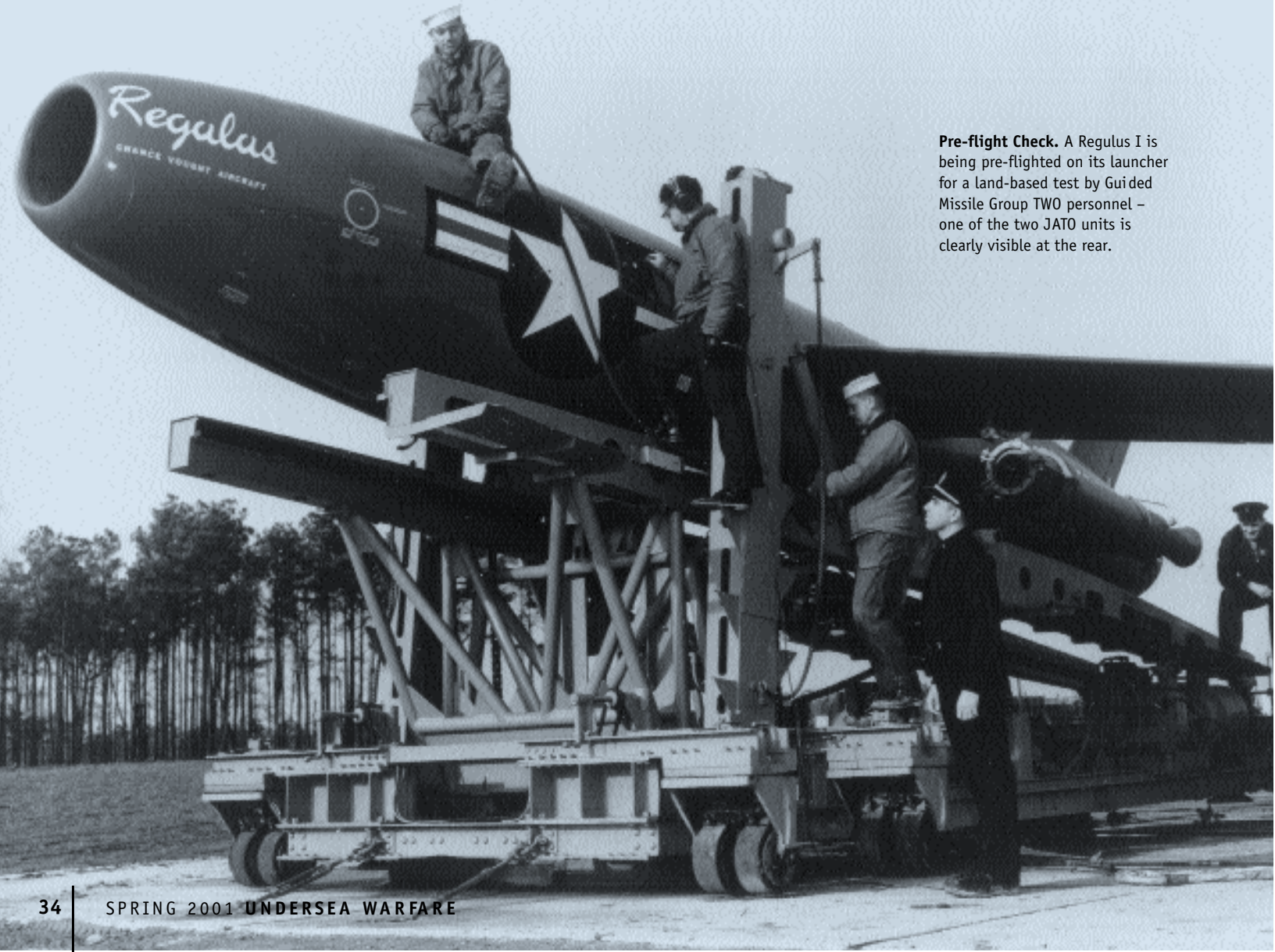
In one stroke, the SSBN/Polaris combination eliminated all the disadvantages of the Regulus system: surface launch, liquid fuel, dependence on active tracking and guidance, limited range, small hangar capacity, and a host of other drawbacks. With submerged launch, virtually unlimited endurance, and near invulnerability, the new strategic deterrent quickly supplanted Regulus and the SSG/SSGN. It was not until December 1964, however, that USS *Daniel Boone* (SSBN-629) conducted the first Polaris patrol in the Pacific, departing Guam that month. Thus, Regulus deterrence was maintained in the western Pacific until May, 1964, when *Halibut* conducted the final patrol of the series. By that time, the five Regulus boats had conducted a total of 40 WESTPAC deterrent patrols since October 1959 – and in so doing had pioneered one of the central strategic paradigms of the Cold War. Two generations of SSBNs followed.

The submarines... Where are they now? Of the two former fleet boats, *Barbero* was the first to be decommissioned and stricken from the Navy list in June 1964. *Tunny* reverted back to SS-282 in May 1965, but her large Regulus hangar made possible her conversion to a troop-carrying submarine, newly designated APSS-282, in October 1966. In this role during 1967, she participated in a number of special operations off the coast of Vietnam. Subsequently, *Tunny* was decommissioned for the final time in June 1969 and sunk as a target just a year later.

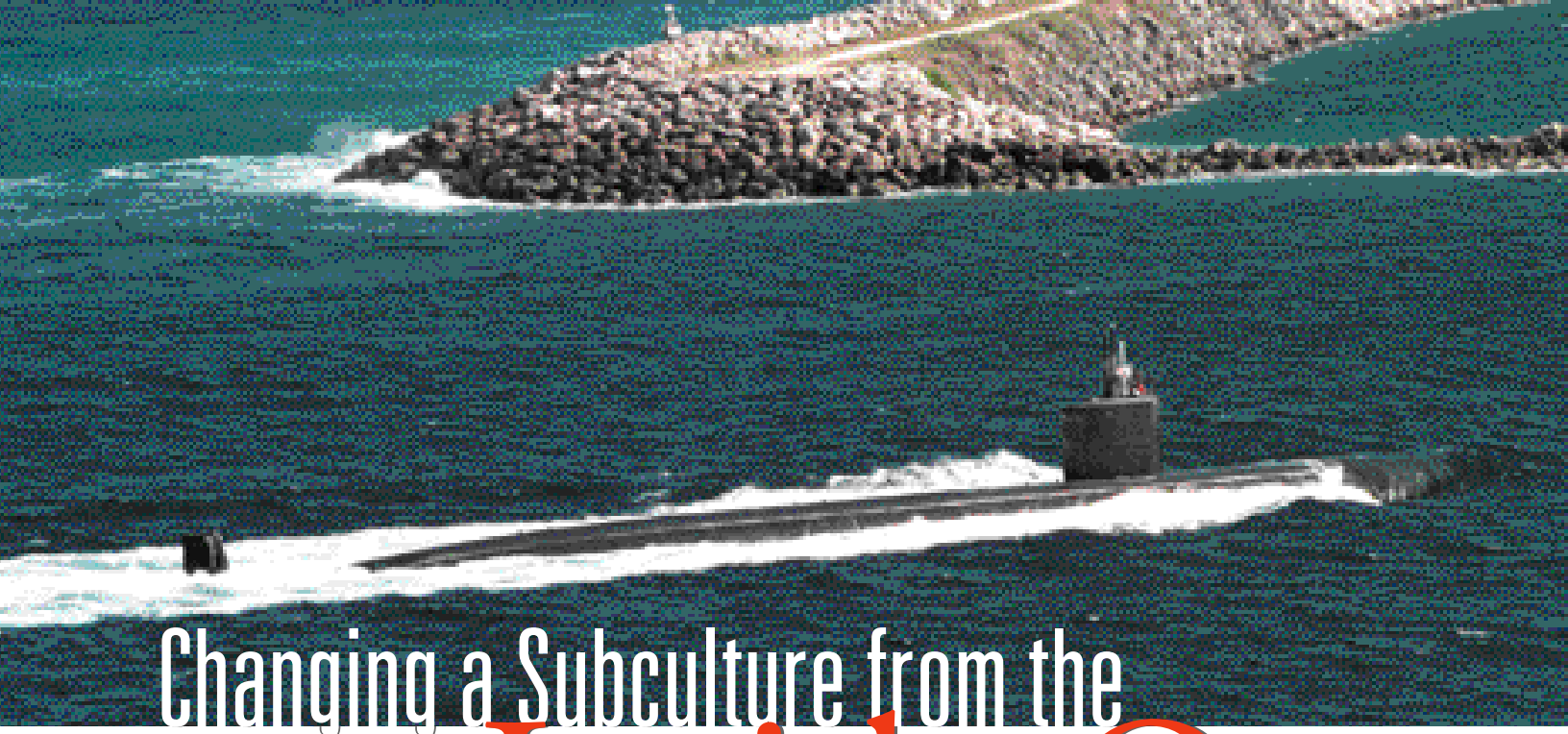
Similarly, with her Regulus installation removed, *Grayback* served as an amphibious transport (LPSS-574) from May 1969 to mid-1980. The ship was later stricken from the Navy list in January 1984 and sunk as a missile target in 1986. With her missile handling and guidance equipment removed, *Halibut* was converted to a test platform circa 1965 and used ostensibly in developing the Deep Submergence Rescue Vehicle (DSRV) – but actually for more highly-classified projects – until she was decommissioned in June 1976.

The happiest fate was reserved for *Growler*, which was decommissioned and placed in reserve in May 1964. Stricken from the Navy list in August 1980, *Growler* is now preserved in virtually original condition as part of the USS *Intrepid* Sea-Air-Space Museum in New York City, along with an example of the Regulus I missile. David K. Stumpf's *Regulus – the Forgotten Weapon* (Turner Publishing, 1996) provides an authoritative and detailed account of the entire Regulus program and its associated platforms.

Dr. Whitman is the Senior Editor of *Undersea Warfare Magazine.*



Pre-flight Check. A Regulus I is being pre-flighted on its launcher for a land-based test by Guided Missile Group TWO personnel – one of the two JATO units is clearly visible at the rear.



Changing a Subculture from the Inside Out

by COMSUBPAC Public Affairs

A native of Pleasantville, New York, former COMSUBPAC RADM Albert H. Konetzni, Jr. graduated from the Naval Academy in 1966, served aboard numerous submarines, commanded the USS Grayling (SSN-646), and came to SUBPAC from command of SUBGRU SEVEN, Yokosuka, Japan. His departure for a new assignment as Deputy Commander and Chief of Staff U.S. Atlantic Fleet, Norfolk, Virginia, creates a good opportunity to look back over SUBPAC's accomplishments during his recent tenure – and to record some of his own impressions.

Large organizations are often accused of following Newton's first law of motion: A body in a state of uniform motion tends to continue in that same direction unless acted on by an external force. In May 1998, the Pacific Submarine Force, U.S. Pacific Fleet (SUBPAC) felt a powerful "external force" when their new commander reported onboard. Now, after a tenure of nearly three years, RADM Al Konetzni has recently relinquished command of SUBPAC to RADM John Padgett, leaving a significant legacy in his wake. "I think there's been some real change – for the better – but truly it was a combination of the environment, lots of committed, hard-working people, and a little bit of luck," Konetzni said.

The Commander of the Pacific Submarine Force has responsibility for more than 11,000 people, including more than 40 submarine crews and their families. From early in his tour, RADM Konetzni has emphasized three themes in defining the goals and focusing the effort of each member of the SUBPAC command: **efficiency, engagement,** and **people.**

Efficiency – Doing Too Much with Too Little

After a decade of drawing down, the Submarine Force in 1998 was well along in decommissioning a quarter of its attack submarines, and it became clear that "doing more with less" was going to be a way of life. The numbers told the story. Deployed operational tempo (OPTEMPO), personnel tempo (PERSTEMPO), and reactor core usage were all increasing and threatening to undermine the long-term viability of the force. The time between six-month deployments was shrinking – resulting in fewer and increasingly more stressful in-port periods, as well as sub-optimum maintenance for deployed submarines. Additionally, important missions went unsatisfied because there simply were not enough boats for the taskings. As the admiral put it, "We worked really, really hard to squeeze every drop of efficiency out of the force. But eventually it became like rearranging deck chairs on the *Titanic*. There was no way we could reconcile having too few attack subs and too many missions. But we did gain some savings from initiatives within our control."

The COMSUBPAC staff quickly devised and implemented a plan to use the ships at hand more efficiently; they started with the ships' schedules. "He certainly challenged some old-school thoughts on how to employ and train submarines and their crews," said CDR Tom Bayley, COMSUBPAC Force Operations Officer. Deployed submarines were assigned mini-AORs (Areas of Responsibility) so that missions, port visits, and support taskings would be concentrated within one relatively localized area. Concurrent training during exercises optimized the use of underway time, and SSBNs began to serve in "attack" roles while they were already underway. One controversial initiative was to homeport as many as three attack submarines in Guam to increase the number of operating days available. "I can tell you that not all of these innovations were popular with everyone, but they helped relieve some of the burden felt by the guys on the tip of the spear," said Capt. Stan Mack, the COMSUBPAC Deputy Chief of Staff for Strategic Systems.

For submarines between deployments, Konetzni and his staff reduced demands on the crews during the Inter-Deployment Training Cycle. Some inspections were consolidated, while others were deleted; hard-pressed engineering departments were better manned; in-port duty section rotations were improved; training was transferred off-ship so crews could concentrate without distraction; and an eight-hour in-port work day was encouraged, with a half-day off during the work week.

(above) ET3 Michael Ozuna (left) and MM3 Ken Warren enjoy swim call on USS *Georgia* (SSBN-729) off Lanai, Hawaii. Warren noted, "I really enjoyed the swim call. The barbecue topside, the fresh air, and swimming were awesome."

(left) The Guam-based submarine tender USS *Frank Cable* (AS-40) returns to her home port.

"It wasn't easy – we placed a significant amount of pressure on the Commanding Officers, Execs, and COBs," said the admiral. "We told them they had to plan harder and be as efficient as possible with each person and every second. For far too long we had fallen into the mentality that Sailors' time and lives took a back seat to demands of the ship. It was painfully clear to me – and anyone who saw the data – that we didn't have a choice. We had to get those boys some relief."

Engagement – With the Public, the Fleet, and the Allies

The second leg of the COMSUBPAC triad of themes has been engagement. RADM Konetzni has strongly encouraged submariners to engage allies, the public, other services, and especially other communities within the Navy. "As a force, we have been way too closed-off – by our own choice. I truly believe we are doing ourselves a disservice when we don't reach out to those that could benefit from understanding our contribution," he said. As his staff addressed efficiency issues, the admiral himself took a strong lead in educating the American public about the current status of the Submarine Force. In a departure from traditions that had earned the community a reputation as "The Silent Service," Konetzni routinely entertained the media and gave frank, open interviews. He challenged his Commanding Officers to engage the public as well and to offer their unique insight. "I saw mission numbers creeping up when I was in Japan [as COMSUBGRU SEVEN], and then it really hit me when I got here. There really was a disparity between the dwindling number of attack submarines available and increased tasking by the national leadership. It struck me that most people didn't have the same perspective that I had here in my position," he said.

In the spring of 1999, the USS *Hawkbill* (SSN-666) rose to the challenge on her final deployment for the fifth Science Ice Expedition dedicated to scientific research in the Arctic. In supporting an ice camp for civilian scientists, *Hawkbill's* crew attracted unprecedented media coverage to what would normally have been a quiet final mission. Among other outlets, CNN, National Geographic, The *Christian Science Monitor*, and ABC News covered the boat's important effort for Arctic science. "I thought that was a huge, huge milestone for us as an organization, because it showed all the other crews that it's okay to go out there and engage the public – and that they have a great deal to be proud of," said Konetzni.

Another aspect of the "message" has been COMSUBPAC's position against the premature scrapping of *Los Angeles*-class attack submarines with significant hull life remaining. "There are three basic ways to get the numbers all the rigorous, analytical studies have indicated we need. First, leadership needs to refuel those *Los Angeles*-class attack submarines that still have hull life on them. Second, we ought to convert those four older SSBNs to Tomahawk-carrying, SOF (Special Forces) SSGN submarines. Finally, we need to get the submarine build rate up to a commensurate level, probably two submarines a year," said Konetzni. After nearly three years of public discussion by the entire Submarine Force senior leadership, money has now been earmarked to refuel some attack submarines, and to study the feasibility of converting the four older *Ohio*-class submarines to SSGNs.

Another recent command initiative has been to embark submarine squadron commanders with aircraft carrier battle groups to ensure the battle group commanders have the best possible insight into the unique capabilities offered by submarines assigned to them. In addition, SUBPAC has worked hard to form closer relationships with allies throughout the Pacific. "RADM Konetzni led the effort between Australia and the States to build a lasting, symbiotic relationship within our submarine communities," said CDR David Nichols, a former Royal Australian Navy liaison officer on the COMSUBPAC staff. "He really cut through the red tape and just made things happen." The two countries have now evolved joint Prospective Commanding Officer (PCO) training, in which each

nation dedicates its top submarines and submariners to share combat understanding and tactics.

Similarly, SUBPAC is fostering international exercises, such as PACIFIC REACH 2000, which brings Pacific Rim countries together to train for submarine rescue. Konetzni argues there are several important reasons for this kind of engagement with foreign navies: "We have worked to earn the respect and trust of our warfighting partners in the Pacific, but it's important that we form more than understanding – we have to form real relationships to create stability and influence. Efforts like PACIFIC REACH – I think – did that."

Despite SUBPAC's aggressive efforts on behalf of international engagement, RADM Konetzni admits that there remains a lot to be done. "I can tell you that despite my direction to maximize working with our friends, the truth is that our engagement trends are all well below where they should be – where they need to be. It's simple math. With today's demand for real-world missions, it's not unusual for foreign exercises to get cut. I've had allied friends – real friends – in the Pacific come to me and ask 'Are you upset with us? Why do you choose not to exercise with us?' Of course we explain that we want to – we just don't have a platform available. It is tough to forge relationships when you repeatedly turn down our Pacific partners in peace," he noted.

RADM Konetzni and the COMSUBPAC "tribe."

Nurturing the "Tribe"

Several new SUBPAC initiatives have reflected Konetzni's strongly felt concerns about submariners themselves. "I tell this to everyone I meet – the one thing I'm proudest of is a genuine force-wide determination to treat each other like the professionals we are – and that it is truly fantastic to be a submariner in the Pacific Submarine Force," he said. When he assumed command in 1998, the first-term retention rate for Sailors afloat was well below 30 percent. Moreover, the attrition rate of Sailors who never made it to the end of their original contract before being selected out of the Navy approached 25 percent. Currently, the retention rate has more than doubled to nearly 60 percent, while the attrition rate has dropped to roughly ten percent. COMSUBPAC's success in retaining Sailors quickly drew significant media interest, and their approach was outlined on the front page of the *Wall Street Journal* last July. "I have to say that in my Navy experience, I've regularly heard folks say, 'People are our most important resource' – and then treat them like slave labor! I made it clear to my COs and COBs that people were my number one priority, and that I wasn't just saying it. I meant it," said Konetzni. "There's a reason he got that nickname, 'Big Al – the Sailors' Pal,'" said CAPT Bob Brandhuber, COMSUBPAC Chief of Staff and former COMSUBRON SEVEN. "He is."

It was one thing for their leadership to recognize that submariners are important; it was another for the Sailors to believe it themselves. RADM Konetzni felt that there ought to be more public recognition of submarine crewmembers and saw the Submarine Centennial as an opportunity to re-energize pride from within. Taking an unusual step, he openly encouraged Commanding Officers to flaunt their boats' accomplishments and seek recognition for their crews. Submariners teamed up with the Navy Band to march in the 2000 Tournament of Roses Parade in Pasadena. Other events ranged from having a group of submarine Sailors climb Oregon's Mount Hood to plant the Centennial Jack, to entering a submarine team in a demolition derby.

The crew of the USS *Topeka* (SSN-754) gained international fame when they celebrated the new millennium submerged at 400 feet exactly where the International Date Line and the Equator intersect. Thus, when the clocks rolled, the ship was simultaneously in two hemispheres, two seasons, two millennia, and two different days. Meanwhile, the Commanding Officer of USS *Bremerton* (SSN-698) was being interviewed on CNN while his deployed submarine was in Singapore for a port visit.

"Even while I've felt so good about what we're doing, too many guys have had their chins on their chest," Konetzni said. "The Submarine Force – the whole Navy – has so much to offer young folks, but sometimes we've failed to make that case. It didn't help that in the shadow of the long drawdown, we've also had a 'zero-defect' mentality. If you wanted to stick around in this outfit, you had to be perfect, and heaven help you if your superiors felt you were out of line. I think folks in our business have looked over their shoulder for so long to see how they've been doing that they lost the ability to see the unique opportunities right in front of them."

Another one of Konetzni's "labors of love" was the renovation of Lockwood Hall at the Pearl Harbor Submarine Base. Named for World War II COMSUBPAC VADM Charles Lockwood, this historic Bachelor Officer Quarters includes the "Skipper's Lounge" and the "Clean Sweep Bar." "I want my young guys surrounded by memories of Medal of Honor and Navy Cross winners," said Konetzni. "Looking at the old pictures, it's crystal clear that today's crews really aren't all that different from the guys then. We still send youngsters 'over there' to provide stability and to do our nation's business."

Saying Aloha

In leaving, RADM Konetzni said he looks back on his tour with considerable satisfaction. "I think each person played just the right role and made just the right contribution to effect real change for the positive," he said. "We've had ups and downs, but I get the sense here that everyone from the deck-plates on up has been emotionally invested in changing the way we view ourselves and what we do. I'd like to think the Pacific Submarine Force is only just getting started, and I wish I could be around here for the ride – but duty calls."

Rising to Victory

The Pacific Submarine Strategy in World War II

by Edward C. Whitman

Previous UNDERSEA WARFARE articles on U.S. submarines in the Pacific during World War II have focused largely on individual "submarine heroes" and their extraordinary war records. In contrast, the present two-part article attempts to step back and view the Pacific submarine campaign from a theater perspective that illuminates both its wartime context and the evolution of a top-level strategy.

Part I: Retreat and Retrenchment

Strategic Background

Since the era of the Spanish-American War, when the United States first assumed territorial responsibilities in the western Pacific, contingency plans had been prepared to deal with the possibility of war with Japan. Known as the "Orange" series in their many revisions, these war plans all assumed that the Japanese would initiate hostilities against the United States with an attack on the Philippine Islands. In response, the U.S. Asiatic Fleet and the in-country Army garrisons would be tasked with fighting a delaying action there until the U.S. Pacific Fleet could arrive from the West Coast to defeat the Japanese Navy in a classic Mahanian sea battle.

In the late-1930s, with Japanese aggression in East Asia an increasing threat, the Orange Plan – by then named "Rainbow Five" – loomed ever larger in the Navy's strategic thinking. Consequently, just before the opening of World War II in Europe, President Franklin Roosevelt ordered the U.S. Pacific Fleet to shift its operating bases from the West Coast to Pearl Harbor. Simultaneously, the Asiatic Fleet – consisting nominally of a small surface force and a handful of antiquated submarines – was reinforced by transferring several newer submarine divisions to the Philippines from San Diego and Hawaii.

Thus, at the outbreak of war with the Japanese surprise attack on Pearl Harbor on 7 December 1941, 29 U.S. submarines were stationed in Manila Bay and 21 at Pearl Harbor itself. Of the Manila boats, six were of the old "S" class, seven were "fleet submarines" of the transitional "P" class,

and 12 were more modern fleet boats of the USS *Salmon* (SS-182) class. These units were commanded by CAPT John Wilkes and serviced by two tenders and a converted merchant ship. The 21 submarines of the Pearl Harbor force, under RADM Thomas Withers, included six early V-class fleet boats, three "P" class, and 12 new USS *Tambor* (SS-198)-class submarines. When the war began, however, 11 of the Pearl Harbor boats were in the United States in various stages of overhaul.

The Japanese Onslaught – Retreat to Australia

Simultaneously with the attack on Pearl Harbor, the Japanese moved against Burma, Malaya, Hong Kong, and the Philippines. On 8 December, they bombed out most of the American air force in the Philippines; on the 10th, invaded northern Luzon; and on the 22nd, came ashore at the Lingayan Gulf, 300 miles northwest of Manila. U.S. Army GEN Douglas MacArthur had been responsible for defending the Philippine Islands since 1935. Recognizing that his small garrison and the Philippine Army were no match for the invaders – and in accordance with the original Orange/Rainbow plans – MacArthur began withdrawing southward into defensive positions on the Bataan Peninsula west of Manila Bay and just north of the island fortress of Corregidor at its entrance.

Meanwhile, ADM Thomas Hart, Commander of the Asiatic Fleet, had moved his surface forces southward, out of range of Japanese aircraft on Formosa. This left only the submarines to oppose the coming onslaught, and by 11 December, 22 of his 29 boats had left Manila on their first war patrols to seek out and destroy the expected Japanese invasion forces. On the 10th, however, a massive Japanese air raid on the Cavite Naval Station south of Manila damaged USS *Sealion* (SS-195) beyond repair and destroyed the Cavite repair facility and most of the torpedoes in storage there. *Sealion* was the first U.S. submarine lost in World War II.

Because of inexperience, poor intelligence, and bad luck, the Manila-based submarines sent out to oppose the Japanese invasion were almost totally ineffective. Patrolling the approaches to Luzon, many succeeded in making contact with enemy forces, but their 45 separate attacks produced only three confirmed sinkings – all freighters. Six U.S. boats managed to converge on the Lingayan Gulf on 22 December, but even so, the Japanese stormed ashore virtually unimpeded. Finally, with the fall of Manila clearly imminent, Wilkes decided at the end of the year to abandon the Philippines and move his submarines south to Surabaja in Java. The invaders occupied Manila on 2 January 1942.

Pacific Theater Submarine Force commanders early in the war: *(left to right)* RADM Thomas Withers, COMSUBPAC at the outbreak of war; RADM Robert English, who re-lieved RADM Withers in April 1942; and CAPT John Wilkes, Commander of the Asiatic Fleet's Submarine Force and Commander of the Fremantle force until June 1942.

Tied up at the Submarine Base during the Pearl Harbor attack, USS *Narwhal* (SS-167) (left foreground) nonetheless earned partial credit for destroying at least one Japanese torpedo plane with hastily-organized machine gun fire.

As the Asiatic Fleet retreated southward, the Japanese overran Burma, Malaya, and Thailand. Britain's great bastion at Singapore capitulated on 15 February, leaving the Japanese to concentrate on the Dutch East Indies, where Celebes and Borneo had already been invaded a month before. Withdrawing under relentless Japanese pressure, U.S. submarines nonetheless attempted to stem the tide by concentrating off Japanese staging bases and attacking the invasion forces wherever they could be found. But despite the Navy's courageous rearguard defense, the Japanese were able to take Java in little more than a week after annihilating the surface forces of America, Britain, the Dutch, and Australia (the "ABDA" fleet) in the Battle of the Java Sea on 28 February.

After the loss of the East Indies, U.S. submarines withdrew to ports on the southwest coast of Australia. Since the outbreak of war, they had managed to sink only ten of the enemy: eight merchants, a destroyer, and an aircraft ferry. And of the original 29 Manila boats, four had been lost. Despite the success of nearly a dozen individual submarine missions in re-supplying the beleaguered U.S. troops on Bataan and Corregidor and removing key personnel before Corregidor's final surrender on 6 May 1942, it was not an auspicious beginning.

First Submarines West from Pearl Harbor

Six hours after the Pearl Harbor attack, the Navy Department issued their now-famous order, "EXECUTE UNRESTRICTED AIR AND SUBMARINE WARFARE AGAINST JAPAN." With three just-overhauled submarines newly arrived from the West Coast, the number of boats available at Pearl Harbor rose to 14 soon after the Japanese attack. Almost immediately, RADM Withers sent seven out on initial war patrols – four to reconnoiter Japanese strongholds in the Marshall Islands, and three to the home waters of Japan. The first submarine to undertake an "Empire" patrol to the Japanese homeland – some 3,500 nautical miles distant – was USS *Gudgeon* (SS-211), which departed Hawaii on 11 December, the fifth day of the war. The first of the Marshall Island patrols commenced on 18 December, when USS *Pompano* (SS-181) left Pearl Harbor for surveillance of Wake Island and Wotje.

Ultimately, 24 war patrols were mounted from Pearl Harbor in December 1941 and the first three months of 1942. Of these, eight had targeted Japanese home waters, while the remainder had patrolled the Japanese Pacific islands and the China coast. In the post-war accounting, they were credited with sinking a total of 19 enemy ships, only one of which was a Japanese combatant – the submarine *I-173*, ambushed by *Gudgeon* on 27 January 1942 near Oahu.

Defending the "The Greater East Asia Co-Prosperity Sphere"

By the end of March 1942, Japan had achieved virtually all of her initial objectives in seizing the Philippines, Southeast Asia, and the Dutch East Indies. Moreover, the continuing Japanese pressure on eastern New Guinea placed Australia itself at grave risk, and both Bengal and Ceylon were within striking distance. Japan's primary war aim had been to insure self-sufficiency in strategic materials, and the "Greater East Asia Co-Prosperity Sphere" gained in her lightning campaigns of late 1941 and early 1942 had only to be defended successfully to consolidate that goal. To protect the supply lines that brought oil, rubber, and minerals from Sumatra, Borneo, and Malaya to the homeland, the Japanese created a powerful system of layered defenses. Their World War I mandate over former German possessions in the Mariana, Marshall, and Caroline Islands was transformed into a powerful complex of central Pacific bases centered on the fleet anchorage at Truk in the Carolines. Additionally, to protect their new colonial empire, the Japanese established staging bases in the Palau Islands east of the Philippines and at Rabaul on New Britain, just northwest of the Solomon Islands.

After the Allied retreat to Australia in March 1942, the U.S. high command decided to leave the remaining submarines of the Asiatic Fleet "down under," rather than withdraw them to Pearl Harbor. Not only would they be well positioned there to attack Japanese supply lines between southeast Asia and the homeland, but they could also support the larger Allied decision to divide the theater into two major command areas – one for the southwest Pacific under GEN MacArthur in Australia; and the other for the central and northern Pacific under ADM Chester Nimitz on Oahu. These separate responsibilities also reflected a spirited difference of opinion on how to regain the offensive, with MacArthur – not surprisingly – intent on driving northward from Australia to retake New Guinea and the Philippines – and Nimitz recommending a move westward across the Central Pacific against the Japanese island bases and the enemy homeland. In fact, the two strategies were eventually pursued simultaneously, with frequent top-level squabbling about materiel and manpower priorities.

By March 1942, the Japanese had conquered the Philippines, the Dutch East Indies, Southeast Asia, and half of New Guinea to establish their "Greater East Asia Co-prosperity Sphere." Their first setbacks occurred in the Battles of the Coral Sea and Midway.

Initial Moves in the Southwest Pacific

When CAPT John Wilkes re-established his headquarters at Perth/Fremantle in southwestern Australia in March 1942, he had 25 submarines under his command. This force was augmented by four fleet submarines from Pearl Harbor, but his five S-boats were sent to Brisbane – on Australia's east coast – when six Atlantic Fleet counterparts under CAPT Ralph Christie were reassigned there from Panama. This left 20 submarines in Fremantle to deploy against Japanese supply lines in the southwest Pacific, as well as to undertake "special missions" ordered by GEN MacArthur to pick up and deliver personnel and supplies behind enemy lines. In March and April, the Fremantle boats scored only a half-dozen sinkings.

In late April, the Japanese moved again, mounting a dual sea-borne thrust to occupy Tulagi in the Solomon Islands and complete their conquest of New Guinea by seizing Port Moresby. Although Tulagi fell easily, the Port Moresby force was intercepted in the Battle of the Coral Sea the first week of May, and despite the loss of the aircraft carrier USS *Lexington* (CV-2) by the United States, Japanese designs on the last remnants of New Guinea were thwarted. Four of the Brisbane S-boats managed to get to sea in time to attack several elements of the Japanese invasion force, but their only confirmed kill was a minelayer.

Three weeks after the Battle of the Coral Sea, newly-promoted RADM Charles Lockwood relieved John Wilkes as commander of the Fremantle force. He chose CAPT James Fife, formerly Wilkes' Chief of Staff, to lead a newly re-formed SUBRON TWO, and – more importantly – undertook the first in-water tests to investigate growing evidence that U.S. torpedoes were malfunctioning in combat and were at least partially responsible for the apparent lack of effectiveness of his submarines. Almost immediately, he found that the standard Mark XIV torpedoes were running at least ten feet deeper than their settings and reported those findings to Washington as the first step in fixing torpedo problems that would take at least another year to resolve.

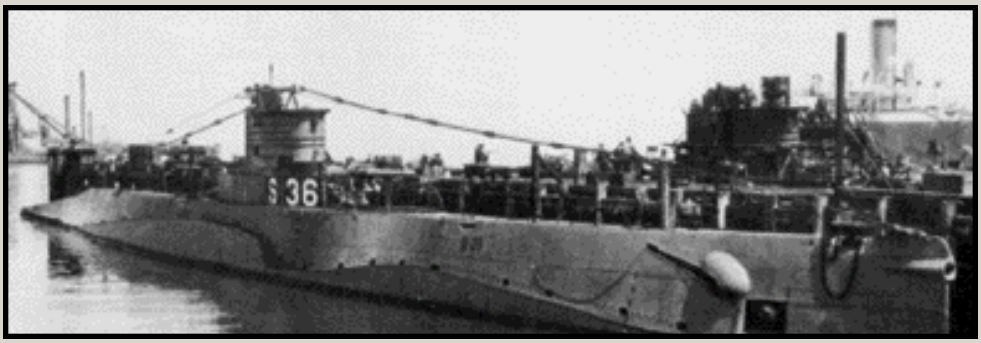
When the Japanese attempted to build on their success on Tulagi by constructing an airstrip on neighboring Guadalcanal, the renewed threat to Port Moresby and Australia's supply lines stimulated the invasion of Guadalcanal by U.S. Marines on 7 August 1942. Planning the initial attack on the Solomons revealed one disadvantage of the Pacific theater's separate commands. The original dividing line between the two areas of responsibility passed east of the Solomon Islands, putting them in GEN MacArthur's domain. However, the only amphibious forces and supporting combatants available for the assault lay under the control of ADM Nimitz, who was naturally loathe to "chop" them to the general. Accordingly, the authorities in Washington dictated a compromise: The boundary line of the Southwest Pacific Area was moved

westward to the 159-degree meridian, just west of Guadalcanal, and the initial invasion of that island was entrusted to VADM Robert Ghormley's South Pacific command, reporting to ADM Nimitz. Then, after Guadalcanal was secured, the responsibility for reducing the rest of the Solomons and regaining New Guinea would revert to GEN MacArthur. To further complicate matters, when the submarine force at Brisbane, under CAPT Christie, was beefed up in anticipation of the Solomons campaign, it functioned under Commander, Submarines Southwest Pacific (COMSUBSOWESPAC – then RADM Lockwood) for operations west of 159 degrees east longitude and under Commander, Submarines Pacific (COMSUBPAC) for operations on the other side of the line.

SUBPAC Operations and the Battle of Midway

Just before the Battle of the Coral Sea, ADM Nimitz had appointed RADM Robert English to succeed RADM Withers as COMSUBPAC. English promptly concluded an agreement with CAPT Wilkes to exchange submarines between their two bases so that Fremantle's boats could be cycled back to the United States for overhaul. Moreover, in transiting to Australia, the Pearl Harbor submarines could undertake war patrols off the Japanese-held islands. Under this arrangement – and with new arrivals from the United States – the number of war patrols from Pearl Harbor increased sharply during April and early May 1942, evenly divided between "Empire" forays and "stake-outs" of the Japanese bases in the Central Pacific. All told, however, between January and May 1942, the Pearl Harbor boats were eventually credited with sinking only 33 enemy ships – approximately 130,000 tons – almost all on patrols to Japanese home waters and the East China Sea.

Then, in mid-May, "ULTRA" cryptographic intelligence provided advance warning of a major Japanese offensive intended to seize first the Aleutians, and then Midway Island, only 700 miles from Pearl Harbor. ADM Nimitz immediately deployed his three remaining aircraft carriers to intercept the multi-pronged enemy attack, and the result was the U.S. victory in the Battle of Midway, 4-6 June 1942, often described as the "turning point" of the Pacific war. As a key element of the riposte, RADM English had sortied all his available submarines and deployed them in two groups: 12 boats west of Midway and seven to the west and north of Oahu. Simultaneously, the Japanese assigned 16 submarines to support their invasion force, but U.S. ULTRA intercepts and radio-direction-finding (RDF) kept them at bay.



(above) USS *S-36* (SS-141) was one of six old S-boats stationed at Manila at the outbreak of the war. Commissioned in 1923, she displaced approximately 1,100 tons submerged and was armed with 4 21-inch torpedo tubes. Limited to only 14 knots on the surface, the S-boats soon proved inadequate for the Pacific theater. After sustaining serious battle damage, *S-36* ran aground and was lost in the Makassar Strait in January 1942.

(left) A pre-war view of the submarine tender USS *Holland* (AS-3) with a nest of six S-boats alongside. *Holland* was commissioned in 1926 and arrived at Cavite just prior to Pearl Harbor. She survived the retreat to Australia and after a 1943 overhaul at Mare Island, served for the duration of the war.

Unfortunately, the American submarines did no better. Confusion, indecision, and poor contact reporting limited them to making only negligible contributions to the U.S. victory. Four Japanese carriers and a heavy cruiser were lost to U.S. aircraft, but of the submarines, only USS *Nautilus* (SS-168) managed to score a hit – on the already-damaged carrier, IJS *Kaga* – and her torpedo was a dud. In contrast, a Japanese submarine, *I-168*, got within range of the crippled aircraft carrier, USS *Yorktown* (CV-5), and sank both her and an escorting destroyer before the former could be taken under tow for Pearl Harbor.

In the northern Pacific, a total of ten old S-boats had been transferred to Dutch Harbor, Alaska, to defend the Aleutians. This was no impediment, however, to a Japanese carrier-based air attack on Dutch Harbor in early June and the seizure of the outer islands of Attu and Kiska as a diversion from the main Japanese thrust at Midway. After that battle, seven fleet submarines joined the S-boats in Alaskan waters, where they mounted an attrition campaign against Japanese occupation and support forces there. Operating in vicious weather and challenging ocean conditions, the Dutch Harbor submarines ultimately sank two destroyers and a pair of patrol craft, but it cost them two of their own number – one to enemy action, and the other to grounding. Notwithstanding the dedication of disproportionate U.S. resources, the Alaskan theater remained a backwater for the duration of the war.

A Disappointing 1942 Winds Down

The U.S. invasion of the Solomon Islands in August 1942 followed the Japanese rebuff at Midway by only two months. Thus, for the remainder of 1942, the U.S. focus shifted to the Southwest Pacific, and even SUBPAC submarines from Pearl Harbor were regularly assigned interdiction missions in support of the Solomons effort. Guadalcanal was not completely secured until February 1943, and for the Navy, the Solomons contest devolved into preventing the Japanese from reinforcing their island garrisons by sea. This led to a series of violent surface actions up and down the island chain, the diversionary attack on Makin Atoll in the Gilberts by Carlson's Raiders, and a concerted submarine campaign to cut Japanese communications from Truk and Rabaul.

For this reason, the submarine force in Australia was significantly augmented in the latter half of the year. After VADM William Halsey relieved VADM Ghormley as the South Pacific commander in November 1942, SUBRONS EIGHT and TEN were transferred from Pearl Harbor – giving Brisbane, under CAPT Christie the largest concentration of U.S. submarines in the Pacific. Earlier – despite RADM Lockwood's strong objection – SUBRON TWO had also been transferred from the Fremantle area, leaving him only eight boats to cover Japanese supply lines from the East Indies and Malaya. Meanwhile, the Pearl Harbor force, now numbering less than 20 boats – but making increasing use of an advanced base at Midway to shorten transit times – was split between blockading Truk and undertaking commerce raiding in Japanese home waters and the East China Sea

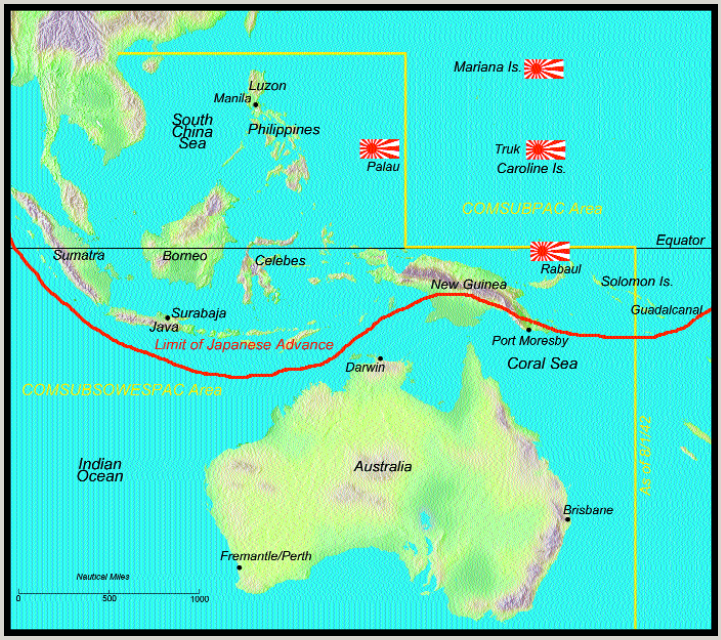
In late 1942, only RADM Lockwood's Fremantle boats and perhaps half of the Pearl Harbor submarines were actively engaged in attacking the supply lines that sustained the enemy war effort. Virtually all of the Brisbane war patrols focused on the Solomons and Rabaul, while many of Pearl Harbor's were targeted at Truk and similar bases, often in reaction to fruitless ULTRA clues. Despite extraordinary individual accomplishments, the resulting dilution of effort seriously limited the effectiveness of U.S. submarines in undermining Japan's war-making capability early in the conflict. As Clay Blair points out in his classic account of the Pacific submarine campaign, *Silent Victory*, the 180 Japanese ships destroyed by U.S. submarines in all of 1942 were matched by German sinkings in the Atlantic during February and March of that year *alone*. Significantly, 45 percent of all the successes that *were* achieved resulted from the 15 percent of war patrols identified as "Empire" missions from Pearl Harbor – which should have been a powerful argument for concentrating on Japanese shipping early in the game.

The record against Japanese combatants was even more disappointing: U.S. submarines sank only two major warships in all 1942 – a heavy and a light cruiser. In contrast, Japanese submarines destroyed two U.S. carriers and a light cruiser, as well as heavily damaging another carrier, a battleship, and a heavy cruiser. Japanese submariners paid a stiffer price, losing 23 boats during the first year – whereas U.S. losses since the beginning of the war totaled only seven submarines, and three of these came from running aground.

For Want of a Nail...

Our relatively poor submarine performance early in the war was due to a number of factors. First – as in the opening phase of any conflict – gaining combat experience, shedding peacetime attitudes, and winnowing out "less-aggressive" and tactically-inept commanding officers took months of actual fighting. Second, it was only the test of war that revealed materiel problems in both the submarines themselves and their torpedoes that crippled the Submarine Force until well into 1943. The older S-boats, for example, were largely inadequate for the demands placed on them in the Pacific, and even nine of the newer fleet boats – to be joined by a whole squadron in 1943 – were equipped with the notoriously unreliable Hoover-Owens-Rentschler (H.O.R.) main propulsion diesels, which frequently broke down on patrol.

But the gravest and most demoralizing technical problems emerged in torpedo performance. As early as the withdrawal toward Australia, many skippers had begun to suspect incidents of torpedo failure that robbed them of "sure" kills. Even as the experience of more and more inexplicable misses and dud hits began to accumulate, and the operators tried to raise the alarm through the chain of command, they were thwarted by a technical community that preferred to blame "human error" for their own failures. It was only when RADM Lockwood undertook his "unofficial" in-water tests in southwestern Australia that the truth about U.S. torpedoes began to be believed, and it was late-1943 before the problem was completely solved. In the interim, countless submarine crews put their lives in danger stalking enemy targets, only to be cheated of their quarry by defective torpedoes.



After the retreat southward from the Philippines, initial Allied counter-offensives concentrated first on defending the approaches to Australia in the Southwest Pacific. U.S. submarines operated from both Fremantle/Perth and Brisbane to attack Japanese supply lines between the Solomons and their bases at Truk, Rabaul, Palau, and the Marianas.

Early 1943 – the End of the Beginning

On 20 January 1943, COMSUBPAC RADM English departed Hawaii by air to inspect submarine support facilities on the West Coast. Caught in a storm off northern California, English's aircraft was driven off course and crashed 115 miles north of San Francisco. All on board were killed. Just prior to this tragedy, Brisbane's CAPT Christie had been transferred to command the Newport (Rhode Island) Torpedo Station and promoted to rear admiral. Although Christie had high hopes for becoming RADM English's replacement at Pearl Harbor, the Navy's Commander-in-Chief, ADM Ernest King, instead selected RADM Charles Lockwood for the job. To the Submarine Force, Lockwood soon proved that he was the right man at the right time, and from then on, their mutual fortunes turned sharply upward.

(Part II of this article, which will appear in the Summer issue of UNDERSEA WARFARE, will describe the turning of the tide under VADM Lockwood's leadership and the concerted anti-shipping campaign that led to the Navy's decisive undersea victory in World War II.)

The New Depot Modernization Period – Not Your Dad's OVERHAUL

by CDR Donald E. Neubert, USN

Consider the task: Prepare for a major overhaul while on a six-month deployment, continue preparations during the four week stand-down, conduct and complete the "availability" while maintaining crew proficiency in preparation for six months of post-shipyard inspections, and – finally – roll into a Pre-Overseas Movement (POM) work-up. Oh, by the way, do it all with the same crew. Does this seem challenging? … impossible? For many, this will become routine. Gone are the days when shipyard availabilities were three to four years long, and the entire crew turned over before the next deployment. Today's shorter maintenance periods require the same crew to prepare, conduct, and complete the availability – and take the ship on deployment. This demanding new schedule will soon affect most of the Submarine Force. In the next few years, more than 35 *Los Angeles*- and *Ohio*-class submarines will experience 12-30 month shipyard availabilities – and *these will not be your dad's overhauls*!

The crew of USS *Chicago* (SSN-721) recently completed a challenging maintenance period which illustrated that, more than ever, submariners are committed to doing more with less.

USS *Chicago* (SSN-721) recently completed a 22-month Depot Modernization Period (DMP), a six-month post-availability test period, and then a six-month POM cycle in preparation for a WESTPAC deployment. Many of the same Sailors that prepared the submarine for the DMP also readied the ship for the challenging deployment that followed. Maintaining steady progress required a solid commitment to the fundamentals, as the crew's basic mission, work environment, watch routines, and lifestyle changed radically with the ship's material condition.

One of the most important requirements was to ensure stable and adequate crew manning – and then to keep it that way for the post-availability inspections. *Chicago* faced a particular challenge when the DMP was extended from 12 months to 22, bringing it right up to the start of the POM. Luckily, many of our personnel transfers occurred at the 15-month point, so the crew was relatively stable for the entire end game.

There were also significant hurdles to overcome in terms of morale and retention, particularly among junior personnel. New Sailors naturally saw the shipyard as "The Navy" – hardly what they thought service life was going to be like. Participating in an availability just doesn't compare to the excitement of being out at sea protecting America's interests and seeing the world! Thus, senior

(continued on page 48)

USS *Honolulu* Makes Dreams Come True

by JO2 McClain Shewman

USS *Honolulu* (SSN-718) recently hosted two children sponsored by the Make A Wish Foundation, an organization whose goal is to brighten the days of families whose members are being treated for cancer. Working together, *Honolulu* and the foundation were able to help make the dreams of two children, Brian Elsea and Dustin Gordon, come true.

Photo by JO2 McClain Shewman

Master Chief Billy Cramer, Chief of the Boat on USS *Honolulu* (SSN-718), shows the Make A Wish children and their families the topside of the submarine.

"I feel fortunate that he gets this opportunity," said Brian's father, Charles Elsea. "We've been through rough times, and it's a break from the medical treatments. This [submarine tour] gives us a chance to get away from our day-to-day lives."

Honolulu's Chief of the Boat, Master Chief Machinist's Mate William Cramer, escorted the tour group, which consisted of ten family members. "Our crew loves doing these tours. They seem to be a bit more personal than the typical visitor tour – it means more," he said. "We're a family-oriented crew, and we're proud of what we do. We're thrilled that people like Brian and Dustin have so much interest in submarines and our lives as submarine Sailors."

"Since I can remember, he's been interested in the military and Navy ships," Charles said, remembering how Brian used to make ships out of Lego building blocks.

During the tour, the group visited the control room, wardroom, and sleeping quarters, and were even allowed to crawl in the torpedo tubes, which Dustin admitted was his favorite part of the tour.

During their stay in Hawaii, the families also visited the Polynesian Cultural Center, attended a luau, and even went snorkeling and deep-sea fishing.

The Make A Wish Foundation grants the wishes of children with life-threatening illnesses, and is the largest wish-granting organization in the world, with 81 chapters in the United States and its territories, and 22 international affiliates across five continents.

Special Recognition

Congratulations to USS *Pasadena* (SSN-715), which recently earned the Morale and Welfare Recreation (MWR) Fleet Recreation Award for the entire Navy; this is the first time the honor has gone to a small command. Special congratulations to *Pasadena's* Recreation Committee, including LT Brian Huntley, MM2(SS/DV) Russ Wagner, MS2(SS) David Holmes, MM2(SS) Joseph Tomasello, MM1(SS) James Ambrosia, ET2(SS) Grady Lott, HM1(SS) Michael Miller, ET3(SS) Thomas Steele, MM1(SS) Nicholes Naquin, and MS2(SS) Chris McClurkin.

Congratulations to USS *Charlotte* (SSN-766) and Patrol Squadron Nine (VP-9) for receiving the COMSEVENTHFLT Award for Excellence 2000 in the Undersea Warfare Excellence category. This award is presented to the ship, patrol squadron/detachment, CVW squadron, and submarine that contribute most to the advancement of undersea warfare tactics in the Seventh Fleet area of responsibility. Patrol Squadron Four (VP-4) also received an award for SUW Excellence.

Congratulations to Naval Submarine Base Bangor for receiving the FY 00 Secretary of the Navy Environmental Awards Winner in Pollution Prevention for an Industrial Installation. Qualified SECNAV winners will compete in the Department of Defense FY 00 Environmental Security Awards Program.

2001 Naval Submarine League Award Winners

Frederick B.Warder Award for Outstanding Achievement

LCDR Teryl Edward Chauncey, COMSUBGRU TEN

Levering Smith Award for Submarine Support Achievement

LCDR Thomas Arthur Gabehart, Naval Submarine Support Facility, New London, CT

Charles A. Lockwood Awards for Submarine Professional Excellence

LCDR Paul A. Whitescarver, USS Minneapolis-Saint Paul (SSN-708)

MMC(SS) Norman K. Ford, USS Florida (SSBN-728) (GOLD)

ET1(SS) Marvin Leroy Keen, Jr., USS Houston (SSN-713)

Frank A. Lister Award for Outstanding Chief of the Boat

MTCM(SS) Jeffery S. Hudson, USS Wyoming (SSBN-742) (BLUE)

RADM Jack N. Darby Award for Inspirational Leadership

CDR Barry L. Bruner, USS Florida (SSBN-728) (GOLD)

Dolphin Award for Longest Qualified Submariner Currently Serving On Board a Submarine (OFF/ENL)

CDR John Elnitsky II, USS Maine (SSBN-741) (BLUE)

ETCM(SS) Gregory P. Fisher, USS Tucson (SSN-770)

Qualified for Command

LCDR Michael Brunner, USS West Virginia (SSBN-736) (BLUE)
LT Kevin Byrne, USS Tennessee (SSBN-734) (GOLD)
LT Timothy Cauthen, USS Maryland (SSBN-738) (BLUE)
LT Todd Cloutier, USS Pittsburgh (SSN-720)
LT Matthew Dean, USS Hyman G. Rickover (SSN-709)
LT John Francher, USS Ohio (SSBN-726) (GOLD)
LT Douglas Jordan, USS Hampton (SSN-767)
LCDR Joel Kennedy, PCU Jimmy Carter (SSN-23)
LT Joseph Lockwood, USS Rhode Island (SSBN-740) (GOLD)
LCDR Dana Nelson, USS City of Corpus Christi (SSN-705)
LCDR Mark Oesterreich, USS Ohio (SSBN-726) (GOLD)
LCDR David Quinn, USS Rhode Island (SSBN-740) (BLUE)
LCDR Gary Rogeness, USS Rhode Island (SSBN-740) (GOLD)
LCDR John Sager, USS West Virginia (SSBN-736) (GOLD)
LCDR Rick Seif, USS Oklahoma City (SSN-723)
LT John White, USS Houston (SSN-713)
LCDR Michael Wilson, USS Pittsburgh (SSN-720)
LCDR Samuell Worthington, USS Louisiana (SSBN-743) (GOLD)

Qualified Surface Warfare Officer

ENS Kevin Alford, USS Frank Cable (AS-40)
CWO2 (Select) Askew, USS Frank Cable (AS-40)
ENS Timothy Rockwell, USS Frank Cable (AS-40)

CAPT Cecil Haney Wins 2001 Golden Torch Award

By LT Willie F. Harbert

CAPT Cecil Haney was recently presented with the 2001 National Society of Black Engineers (NSBE) Golden Torch Award for Technical Achievement in Government. Currently serving as a Congressional Appropriations Liaison Officer at the Office of the Under Secretary of Defense, Haney works on defense appropriation issues with both the House of Representative and Senate appropriation subcommittees.

A 1978 graduate from the Naval Academy, Haney's career included tours aboard USS *John C. Calhoun* (SSBN-630), USS *Hyman G. Rickover* (SSN-709), and USS *Asheville* (SSN-758). He also served as the Radiological Controls Officer on the USS *Frank Cable* (AS-40). Serving as Commanding Officer of the USS *Honolulu* (SSN-718) from 1996 to 1999, he became the fourth African-American naval officer to command a nuclear-powered submarine.

NSBE is the premier technical organization for African-American students and professionals, with membership exceeding 13,000 engineers. The Navy is a corporate sponsor of the organization and has continued to develop a strong relationship on the national, regional and local levels. The Golden Torch Award is presented annually to individuals who have made significant contributions to their profession.

Flag Notes

VADM Edmund P. Giambastiani, Jr., has been nominated for assignment as senior military assistant to the Secretary of Defense, Washington, D.C. VADM Giambastiani is currently serving as Deputy Chief of Naval Operations for Resources, Warfare Requirements, and Assessments, N8, Office of the Chief of Naval Operations in the Pentagon.

VADM Malcolm I. Fages has been promoted to the grade of vice admiral, with assignment as Deputy Chairman, Military Committee, North Atlantic Treaty Organization, Brussels, Belgium. VADM Fages formerly served as Director, Submarine Warfare Division (N77), Office of the Chief of Naval Operations, Washington, D.C.

RADM Paul F. Sullivan has been assigned as Director, Submarine Warfare Division (N77), Office of the Chief of Naval Operations, Washington, D.C. RADM Sullivan formerly served as Director, Plans and Policy, United States Strategic Command.

RADM John Byrd relieved RADM Paul Sullivan as Director, Policy and Plans, United States Strategic Command. RADM Byrd formerly served as the Deputy Director, Plans and Policy, Office of the Chief of Naval Operations.

RADM (Lower Half) Joseph E. Enright has relieved RADM Joseph J. Krol Jr. as Commander, Submarine Group Seven in Yokuska, Japan. RADM Krol has relieved as the Deputy Director, Plans and Policy, Officer of the Chief of Naval Operations.

RADM (Lower Half) Gerald L. Talbot Jr. is being assigned as Commander, Submarine Group Ten. RADM Talbot is currently serving as Director, Navy Staff, Office of the Chief of Naval Operations, Pentagon, Washington, D.C.

RADM (Lower Half) Mike Tracy has relieved RADM Padgett as Commander, Submarine Group Two.

RADM (sel.) Charles B. Young has been assigned as Vice Commander, Naval Sea Systems Command, Washington, D.C.

Congratulations to the following submariners who have been nominated for appointment to the grade of Rear Admiral (Lower Half):

CAPT John D. Butler, who is currently serving as Executive Assistant, Office of the Assistant Secretary of the Navy for Research, Development and Acquisition, Washington, D.C.

CAPT Jeffrey B. Cassias, who is currently serving as Executive Assistant, Force Strucure, Resources, and Assessment Directorate, J8, Joint Staff, Washington, D.C.

CAPT Patrick W. Dunne, who is currently serving as Deputy Chief of Legislative Affairs, Office of Legislative Affairs, Washington, D.C.

CAPT David A. Gove, who is currently serving as Executive Assistant to the Chief of Naval Operations, Washington, D.C.

CAPT Stephen E. Johnson, who is currently serving as Program Manager, SSN 21, Office of the Assistant Secretary of the Navy for Research, Development and Acquisition, Washington, D.C.

CAPT Paul S. Stanley, who is currently serving as Chief, Program and Budget Analysis Division, J8, Joint Staff, Washington, D.C.

Supply Officer Qualified in Submarines

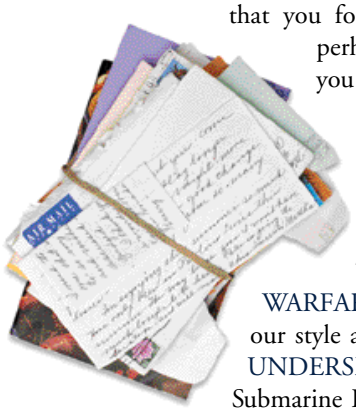
LT Geoffrey Lyster, USS Georgia (SSBN-729) (GOLD)
LTJG Jorge Malavet, USS Maine (SSBN-741) (BLUE)
ENS Sebastian Kielpinski, USS Maine (SSBN-741) (GOLD)
ENS Carl Ward, USS Nebraska (SSBN-739) (GOLD)

USS Scranton Celebrates 10th Anniversary

All five of the officers who have commanded USs *Scranton* (SSN-756) gathered in the ship's namesake city recently for festivities commemorating the 10th anniversary of the ship's commissioning. The focal point was the dedication of a bronze plaque at Scranton City Hall. Following the unveiling of the plaque and remarks, the key participants joined in an anniversary cake cutting. *Pictured from the left:* CAPT Greg Meyer, CO from 1988 to 1991; Mr. Rocco Valvano, Lackawanna County (PA) Head of Veterans Affairs; Mr. Joe Sylvester, President, USS *Scranton* Commissioning Committee; CAPT Tom O'Connor, CO from 1991 to 1994; Honorable James Connors, Mayor of Scanton, PA; CAPT John Bird, CO from 1994 to 1996; CDR Earl Carter, current CO since 1999; and CAPT (select) Ken Walker, CO from 1996 to 1999.

Send us your Feedback!

Have you ever wanted to comment on an article you've recently read in UNDERSEA WARFARE Magazine? Has an article ever left an unanswered question in your mind, or made you wonder why we haven't focused more on certain topics related to the U.S. Submarine Force? Was there a recent article that you found particularly interesting and informative – or perhaps found lacking important information – which you wanted to point out to us? **Well, now you can!**



Beginning with our Summer 2001 issue, UNDERSEA WARFARE will feature a Letters to the Editor section. In traditional form, this section will feature submissions from our readers pertaining to the quality and content of the magazine. The Spring 2001 issue of the UNDERSEA WARFARE marks the culmination of many recent changes to our style and format, and we want to know what you think. UNDERSEA WARFARE is the official magazine of the U.S. Submarine Force, and we are always striving to better serve the interests of our readers, but it's up to you to let us know how we are doing. As we said in our inaugural issue, this is *your* magazine, and only you can help us to stay interesting and relevant to the submarine community.

As you write your letters, please make sure to note the specific article and/or issue you are commenting on, and be aware that some letters may be edited for content and space constraints. We look forward to receiving your comments and suggestions!

Send your feedback to: Military Editor, Undersea Warfare CNO (N77C), 2000 Navy Pentagon, Washington, DC 20350-2000. Or E-Mail at: subwarfare_mag @ hq.navy.mil.

Qualified Nuclear Engineer Officer

LTJG Kieth Baravik, USS L. Mendel Rivers (SSN-686)
LTJG Alonzo Barber III, USS Florida (SSBN-728) (BLUE)
LTJG Brian Benney, USS Louisiana (SSBN-743) (BLUE)
LTJG Robert Berg, USS Bremerton (SSN-698)
LTJG Brian Blair, USS Charlotte (SSN-766)
LTJG James Boerner, USS Ohio (SSBN-726) (GOLD)
LTJG Daniel Breton, USS Parche (SSN-683)
LTJG Ian Bruce, USS Henry M. Jackson (SSBN-730) (GOLD)
LTJG Marc Carlin, USS Boise (SSN-764)
LTJG Benjamin Chance, USS Wyoming (SSBN-742) (BLUE)
LTJG Raymond Chesney, USS Nebraska (SSBN-739) (BLUE)
LTJG Sebastian Dachenhausen, USS Key West (SSN-722)
LTJG Michael Daigle, USS Miami (SSN-755)
LTJG Michael Darcy, USS Maryland (SSBN-738) (BLUE)
LTJG Keith Douglas, USS West Virginia (SSBN-736) (BLUE)
LTJG Sean Duncan, USS Oklahoma City (SSN-723)
LTJG Jacob Foret, USS Honolulu (SSN-718)
LTJG Allen Garner, USS Pasadena (SSN-752)
LTJG Jason Geddes, USS Henry M. Jackson (SSBN-730) (GOLD)
LTJG Todd Glidden, USS L. Mendel Rivers (SSN-686)
LTJG Jeffrey Gromatzky, USS Charlotte (SSN-766)
LTJG Kenneth Harper, USS Alabama (SSBN-731) (BLUE)
LTJG Eric Higgs, USS Providence (SSN-719)
LTJG Robert Hill, USS Nebreaska (SSBN-739) (BLUE)
LTJG Michael Hollenbach, USS Florida (SSBN-728) (BLUE)
LTJG Matthew Jarman, USS Alaska (SSBN-732) (GOLD)
LT Zachery Jones, USS Montpelier (SSN-765)
LTJG Joseph Kerner, USS Olympia (SSN-717)
LTJG Michael King, USS Tennessee (SSBN-734) (GOLD)
LTJG Bradley Knope, USS Los Angeles (SSN-688)
LTJG Roger Koopman, USS Buffalo (SSN-715)
LTJG Kevin Macy, USS Miami (SSN-755)
LTJG Jarod Markley, USS Springfield (SSN-761)
LTJG Jeff McDonald, USS Providence (SSN-719)
LTJG Scott McGinnis, USS Seawolf (SSN-21)
LTJG William Michau, USS West Virginia (SSBN-736) (BLUE)
LTJG Jeffrey Mitchell, USS Michigan (SSBN-727) (BLUE)
LT John Mix, USS West Virginia (SSBN-736) (BLUE)
LTJG Christopher Murphy, USS Kamehameha (SSN-642)
LTJG Eric Nelson, USS Augusta (SSN-710)
LTJG Michael Owen, USS Minneapolis-St. Paul (SSN-708)
LTJG Alexei Pawlowski, USS Kamehameha (SSN-642)
LTJG Jacob Pearson, USS Henry M. Jackson (SSBN-730) (GOLD)
LTJG Patrick Perdue, USS Maine (SSBN-741) (GOLD)
LTJG Andrew Presby, USS Houston (SSN-713)
LTJG Jason Rhea, USS Michigan (SSBN-727) (BLUE)
LTJG Andrew Richards, USS Pittsburgh (SSN-720)
LTJG Scott Richert, USS Rickover (SSN-709)
LTJG Andrew Ring, USS Charlotte (SSN-766)
LTJG Christopher Sammarro, USS La Jolla (SSN-701)
LTJG Kevin Robert Shilling, USS City of Corpus Christi (SSN-705)
LT Lee Sisco, USS Helena (SSN-725)
LTJG Leonard Talbot, USS Jacksonville (SSN-699)
LTJG San Trongkamsataya, USS Ohio (SSBN-726) (GOLD)
LTJG Larry Turner, USS Scranton (SSN-756)
LTJG Michael Twarog, USS Albuquerque (SSN-706)
LTJG Brian Vance, USS Toledo (SSN-769)
LTJG Magnum Vassell, USS Philadelphia (SSN-690)
LTJG Gregory Walters, USS Hartford (SSN-768)
LTJG Mark Westmoreland, USS Tucson (SSN-770)
LTJG Mark Wrzyszczynski, USS Rhode Island (SSBN-740) (BLUE)
LTJG Jesse Zimbauer, USS Georgia (SSBN-729) (GOLD)

Commander Undersea Surveillance Hosts Annual Awards

Commander Undersea Surveillance (COMUNDERSEASURV) recently recognized the outstanding performance of the Integrated Undersea Surveillance System (IUSS) by honoring its top performers at the annual IUSS Professional Awards Luncheon.

Pictured left to right, are awardees STG1 David Benson; YN1 Anthony Wall; STG1 Petty Officer William Brummett; LTJG Jason Menarchik.

Junior TAR Officer Leadership Award

LCDR David P. Mackovjak, Commanding Officer, Naval and Marine Corps Reserve Center, Green Bay, WI, was recognized for outstanding leadership with his selection for the RADM Maurice J. Bresnahan, Jr., Junior TAR Officer Leadership Award.

SUBLANT Sailor Selected PLR of the Year

By JO2 Starre Quinones
COMSUBLANT Public Affairs

Yeoman Third Class Petty Officer Sandra V. Manning of Salem, VA has been selected as the Personnel Support Activities' (PSA) Norfolk Pass Liaison Representative of the Year. A PLR is the vital link between Sailors, their commands, and their assigned Personnel Support Detachment (PSD). Each PLR is actively involved in pay, personnel, and travel administration issues. When Sailors have questions or problems with their pay or other related issues, their Command PLR is the first person they go to. The designated PLR addresses the concerns of these Sailors with the PSD to which the command is assigned. Sailors cannot take issues to PSD without first having seen the PLR.

LCDR Donna Cherry, Officer in Charge at PSD Sewells Point said PLRs like Manning are the oil that makes the system work. "I have 10,000 customers, but somebody like YN3 Manning has a much smaller group and takes a personal interest in those folks," Cherry said. "She takes advantage of the opportunities to learn what's needed, so that the SUBLANT staff won't run into problems or obstacles." Manning is currently assigned to COMSUBLANT as the Leave/Database Manager.

Changes of Command

COMSUBRON SEVEN
CAPT Glen Neiderhauser relieved
CAPT Fred Byus

COMSUBRON EIGHT
CAPT Jonathan Sears relieved
CAPT John Bird

SUBASE Bangor
CAPT Duane Baker relieved
CAPT Dave Thomas

Deep Submergence Unit
CDR H. David Clopp relieved
CDR Lee Hall

USS Tucson (SSN-770)
CDR Bill Traub relieved
CDR J. Dennis Murphy

USS Alabama (SSBN-731) (BLUE)
CDR Tom Wears relieved
CDR Kevin Torcolini

USS Florida (SSBN-728) (GOLD)
CDR Kevin Torcolini relieved
CDR Barry Bruner

USS Salt Lake City (SSN-716)
CDR Stephen Marr relieved
CDR William Hoeft

USS Hartford (SSN-768)
CDR Robert Kelso relieved
CDR Fred Diemer USS Boise (SSN-764)

USS Boise (SSN-764)
CDR James Kuzma relieved
CDR David Leach

USS Maryland (SSBN-738) (BLUE)
CDR Steven Davito relieved
CDR Kieth Bowman

Line Officer Qualified in Submarines

LTG David Anderson, USS Wyoming (SSBN-742) (BLUE)
LTJG Horace Ashworth, USS Memphis (SSN-691)
LTJG Patrick Bosserman, USS Montpelier (SSN-765)
LTJG Slade Brockett, USS Providence (SSN-719)
LTJG Timothy Buckley, USS Seawolf (SSN-21)
LTJG Matthew Carmona, USS Wyoming (SSBN-742) (BLUE)
LTJG Bruce Ciccone, USS Rhode Island (SSBN-740) (BLUE)
LTJG Jed Espiritu, USS Alabama (SSBN-731) (GOLD)
LTJG Phillip Fischer, USS Albany (SSN-753)
LT Daniel Foley, USS Seawolf (SSN-21)
LTJG Kevin Grey, USS San Francisco (SSN-711)
LTJG Robert Griffith, USS Pennsylvania (SSBN-735) (GOLD)
LTJG John Hale, USS La Jolla (SSN-701)
LTJG James Jones, USS L. Mendel Rivers (SSN-686)
LTJG William Juzwiak, USS Nevada (SSBN-733) (BLUE)
LTJG Michael Lawlor, USS Pennsylvania (SSBN-735) (BLUE)
LTJG John Long, USS Houston (SSN-713)
LTJG Robert Ore, USS Florida (SSBN-728) (BLUE)
LTJG Vannavong Phetsomphou, USS Kentucky (SSBN-737) (GOLD)
LTJG Todd Santala, USS Florida (SSBN-728) (BLUE)
LTJG Robert Savering, USS Norfolk (SSN-714)
LTJG Matthew Scroggins, USS Honolulu (SSN-718)
LTJG Gene Severtson II, USS Henry M. Jackson (SSBN-730) (GOLD)
LTJG Michael Shannon, USS Toledo (SSN-769)
LT Mark Skubis, USS Memphis (SSN-691)
LT Eric Stenzel, USS Rhode Island (SSBN-740) (BLUE)
LTJG Scott Sundem, USS Houston (SSN-713)
LT Sean Szymanski, USS Pittsburgh (SSN-720)
LTJG Greggory Unger, USS Louisville (SSN-724)
LTJG Ronald Withrow, USS Rhode Island (SSBN-740) (BLUE)
LTJG Jonas Zikas, USS Hartford (SSN-768)

Small Subs Big Payoffs

(continued from page 11)

hydrodynamics, hydroacoustics, and propulsor design, thus supporting technology insertion into current and future SSNs. Two promising areas for future research include submarine maneuverability and electric propulsion development. *Cutthroat* can be modified extensively – but inexpensively – to determine optimum sail shapes and other parameters for maneuverability, and we can evaluate operating procedures – for example, maximum permissible rudder angles at flank speed – without risking damage to an operational SSN or harm to Sailors.

We can also use *Cutthroat* or *Kokanee* to test SSN electric-drive ideas and components at much less cost than modifying a full-scale SSN. If required, we could completely replace either model's propulsion system with a completely different version, and evaluate designs before they get into the fleet. The cost to do that to an operational SSN, in dollars and time, would be prohibitive.

The nation can no longer afford the kind of full-scale submarine prototyping that was pursued in the 1950s and 1960s and which led to the USS *Tullibee* (SSN-597), USS *Jack* (SSN-605), and USS *Glenard P. Lipscomb* (SSN-685). Large-scale model testing provides accurate results at a modest cost. And the ARD represents a low-cost, high-payoff test facility that will help keep our Submarine Force number one in the world for the next 100 years and beyond.

CDR Fox is the Officer in Charge of the Acoustic Research Detachment.

Not Your Dad's Overhaul

(continued from page 43)

personnel needed to show these young Sailors that life in the yard, although occasionally necessary, is not the entire reason for their existence. It certainly helped to couple shipyard duties with stimulating operational and interactive training and to provide opportunities for underway periods on other submarines. Experience on *Chicago* showed that although it takes substantial "juggling" and ingenuity to implement these strategies, the benefits to morale, retention, and operational proficiency far outweigh the scheduling and manpower inconveniences. One way to ease the workload effects of temporary absence is to scour the waterfront for any individuals available to assist in routine shipyard duties, such as fire and barge watches or off-hour paint teams. *Chicago* had significant assistance from reservists during the summer months and from TAD personnel who were unable to get underway on operational submarines. Although a one-to-one swap with an experienced replacement may rarely be achieved, getting a crewmember to sea is the overall goal, and any help you can get is useful.

Once the crew was established – along with a rotational system to get them to sea – the command focused on getting the men ready for assuming operational control of the boat once the shipyard period was over. They had to be prepared to close out maintenance, start up systems, restart preventive maintenance procedures, and qualify on legacy, as well as newly-installed, equipment. Although shipyard testing will give ample opportunity for most of the crew to become proficient with individual systems, the real challenge is getting them to operate together effectively as a unit to run the submarine proficiently. The best way to prepare the crew for the end of availability and the beginning of at-sea operations is to focus on basic submarining. Concentrating on sound silencing, proper maintenance, professional watch-standing, and basic damage control will prepare the crew not only for post-shipyard testing and sea trials, but also for completing the post-DMP inspections and starting the POM. Shifting from "Shipyard Mode" to "Operational Mode" is a challenge for everybody. The steady stream of major tasks that need to be accomplished in a shipyard availability creates a mind-set for looking only as far ahead as the next assignment. In the process, it's easy to lose sight of what an operational ship is supposed to look and feel like. The command needs to work on changing that mind-set and focusing the crew on returning to "the waterfront" as quickly as possible.

Leave is always an important issue. Many personnel on *Chicago* were unable to take leave they desired during the availability because of the need to support shipyard maintenance and testing. This inability to take leave, coupled with the loss of excess leave at the end of the fiscal year, was particularly demoralizing to senior enlisted and their families. Many had accrued leave during the deployment before entering the shipyard in hopes of taking time off when in port. They never imagined this would be a problem in the shipyard. To minimize the adverse effects, CINPACFLT's permission was obtained to roll excess leave from one year to the next, much like the case for deployments. This action had two benefits: it proved to Sailors that the command was aware of the hardships and was committed to easing them; and it showed that the Navy acknowledges that a lengthy shipyard period is not really shore duty, and time can be as constrained as during a deployment.

Another issue – often overlooked – is the effect that family life has on a Sailor's morale. Families new to the service may never have thought that shipyard duty is what Navy life could be like. Other Navy families may offer little understanding of the challenges they face. After all, *their* husband isn't out on deployment! But he's on a boat that they may never have seen – since it's in a secure shipyard – and the only pattern they really notice is that Dad is exhausted when he gets home.

For this reason, forming DMP families into a cohesive group is good for everyone, and keeping lines of communication open between family members and the CO is key. Even something as simple as attending wives' club meetings periodically to answer questions can show families that they're important to the CO. It can also show families how significant the work is that their Sailors go off and do every morning, or night, or both. Ship's picnics, parties, or other get-togethers are also useful for fostering a sense of ship's community. Family members can meet with their counterparts and see that they're not alone in facing difficulties that develop during a shipyard period. Associating names and faces can make it a lot easier for family members to make a call for help or simply find someone else to talk to about their experiences.

After FY 01, more and more submarine crews will be challenged to transition their ships from maintenance to operational status. Specifically, the eleven crews scheduled for yard periods in 2002 should be preparing now to counter the potential adverse effects of their availabilities, as well as working to minimize the time their boat will be unavailable to our smaller Submarine Force.

Hopefully, my experience from *Chicago's* DMP will take some of the bumps out of the shipyard ride for many submariners and their families; especially those who find that goodbyes during the sea tour are more often from a chain link fence than a pier.

CDR Don Neubert was the Executive Officer on USS *Chicago* during a majority of her DMP. He is currently the Submarine Analyst in the Office of Program Appraisal in the Office of the Secretary of the Navy.

SubmarineForwardPresence as of April 2001

PortVisits

Making history in Slovenia

by JO2 Christian Gearhart

Photo by AN Laura Correa

USS Emory S. Land (AS-39) and *USS Norfolk* (SSN-714) sit pier-side at Koper, Slovenia.

USS *Norfolk* (SSN-714) wrote its name in history 2 April, 2001 by becoming the first nuclear-powered vessel to make a port visit to Slovenia on the northern Adriatic Sea. The visit was part of a scheduled port visit by *Norfolk*, a Sixth Fleet attack submarine homeported in Norfolk, Virginia, and USS *Emory S. Land* (AS-39), the Sixth Fleet Repair and Support ship homeported in La Maddalena, Italy. *Emory S. Land* provided the logistical support to *Norfolk* while in Koper, Slovenia. *Emory S. Land* is one of the few remaining submarine tenders and was originally designed to support *Los Angeles* class attack submarines, such as *Norfolk*.

During a press conference with local Slovenian media, RADM Chuck Munns, Commander Submarine Group 8, said both ships visited Koper to give the ship's crews operating experience in all Mediterranean waters. "This is a great opportunity for our Sailors to experience Slovenian hospitality and to increase the crew's quality of life by having shore leave." During the visit, both ships hosted many distinguished Slovenian visitors, including the country's equivalent to our Secretary of State and Chief of Naval Operations.

On The Back

"Score Another for the Subs" by American artist Thomas Hart Benton is well known throughout the Submarine Force. Born in 1889, Benton began his art education at the age of 16, and by 19 was studying in the Latin Quarter of Paris. Deeply moved by the attack on Pearl Harbor, he shortly thereafter completed "The Year of Peril," a series of grim and powerful war paintings. In 1943, he produced the Abbott Collection of Submarine Paintings, primarily aboard the submarine USS *Dorado*.

This particular painting depicts *Dorado* firing on a derelict cargo ship for target practice during its shakedown cruise in the summer of 1943. Following its commissioning in the fall of that year, *Dorado* sailed for the Canal Zone, but never arrived. Air searches discovered oil slicks and widely scattered debris, but no specific identification was ever made. A German submarine was known to be operating in the area, but the actual fate of *Dorado* remains unknown. Artwork and information courtesy of the Navy Art Gallery.

Score Another for the Subs

by Thomas Hart Benton